# ENGINEERING and MINING JOURNAL.

VOL. XXVII., No. 20.

RICHARD P. ROTHWELL, C.E., M.E., ROSSITER W. RAYMOND, Ph.D., } Editors.

WILLIAM H. WAHL, Ph.D., Department of Progress in Science and the Arts.

NOTE.—Communications relative to the editorial management should be addressed to RICHARD P. ROTHWELL, P.O. Box 4404, New York.

Communications for Mr. RAYMOND should be addressed to ROSSITER W. RAYMOND, P.O. Box 1465, New York. Articles written by Mr. RAYMOND will be signed thus *.

SUBSCRIPTION PRICE, including postage, for the United States and Canada, $4 per annum; $2.25 for six months; all other countries, including postage, $5.00 = 20s. = 25 francs = 20 marks. All payments must be made in advance.

REMITTANCES should always be made by Post-Office Orders or Bank Drafts on New York, made payable to THE SCIENTIFIC PUBLISHING COMPANY.

THE SCIENTIFIC PUBLISHING CO., PUBLISHERS,
27 Park Place, New York.


CONTENTS.


| | PAGE. |
|---|---|
| EDITORIALS: | |
| American Society of Civil Engineers. | 349 |
| The May Meeting of the American Institute of Mining Engineers | 349 |
| Utah Mineral Wax | 349 |
| Notes on Zinc Smelting | 350 |
| On the Method of Extracting Gold, Silver, and other Metals from Pyrites. | 351 |
| Lead and Copper Production | 352 |
| Operations at the Rio Tinto Mines in 1878 | 352 |
| The Alden Crusher | 352 |
| Steel from Cleveland (Eng.) Ores | 353 |
| The Pictet Artificial Ice Company | 353 |
| Reports of American Mines under English Management | 356 |
| PROGRESS IN SCIENCE AND THE ARTS: | |
| The Brooks Underground Telegraph System | 354 |
| Telephone Exchanges | 354 |
| The Keely Motor | 354 |
| Sun-Spots and Commercial Crises | 354 |
| Scientific News | 354 |
| The Journal of the Franklin Institute. | 354 |
| The American Chemical Journal | 354 |
| Kansas City Review of Science and Industry | 354 |
| The Sydney Exhibition | 354 |
| Barff's Process for Preserving Iron | 354 |
| Kerite | 355 |
| Virginine | 355 |
| The Decomposition of Metallic Sulphides | 355 |
| Bower's Process for Protecting Iron Surfaces | 355 |
| Glass Type | 355 |
| Huetter's New Explosive Compound. | 355 |
| Artificial *vs.* Natural Dyes | 355 |
| Imperishable Water-Colors | 355 |
| The Gravivolumeter | 355 |
| Process for Utilizing Rubber Waste | 355 |
| Geological Survey Reports | 355 |
| Sulphurets as Fuel | 355 |
| Growth of Gold Nuggets | 355 |
| Nordenskjöld's Expedition | 355 |
| A Ductile and Malleable Alloy | 355 |
| Important to Inventors of Life-Saving Appliances | 355 |
| Use of Iron Cars | 355 |
| Model of an Iron Tie | 355 |
| Improvement in Locomotive Chimneys | 356 |
| Draining Lake Fucino | 356 |
| Wrought-Iron Tube Cars | 356 |
| Railroad Construction | 356 |
| Engineering Items | 356 |
| NOTES: | |
| The British Alkali Trade | 350 |
| A Long Diamond-Drill Core | 353 |
| The Reading Railroad | 3 6 |
| Union Consolidated Mining Company, Tenn | 356 |
| The Electric Light | 356 |
| GENERAL MINING NEWS: | |
| Arizona | 356 |
| California | 356 |
| Colorado | 357 |
| Dakota | 357 |
| Idaho | 357 |
| Montana | 357 |
| Nevada | 357 |
| New Mexico | 358 |
| South Carolina | 358 |
| NEW PATENTS | 358 |
| PROPOSALS | 358 |
| STATISTICS OF COAL PRODUCTION | 359 |
| THE COAL TRADE REVIEW | 359 |
| IRON MARKET REVIEW | 359 |
| FREIGHTS | 360 |
| METALS | 360 |
| BULLION MARKET | 360 |
| FINANCIAL: | |
| Gold and Silver Stocks | 361 |
| The Coal Stocks | 364 |
| Miscellaneous Stocks and Quotations | 364 |
| Gas Stocks | 364 |
| Copper Stocks | 364 |


## AMERICAN SOCIETY OF CIVIL ENGINEERS.

The Eleventh Annual Convention will be held at Cleveland, Ohio, beginning June 17th, 1879.

Details of programme will be issued to members in a short time.

JOHN BOGART, Secretary.

## THE MAY MEETING OF THE AMERICAN INSTITUTE OF MINING ENGINEERS.

The opening session of the May meeting of the American Institute of Mining Engineers was held at the rooms of the Western Iron and Nail Association in Pittsburg, on Tuesday, May 13th, followed by a session in the evening. More than a hundred prominent metallurgists of the country were present. A distinguished visitor was Sir EDWARD COMBES, M.P., of Sydney, New South Wales, now visiting this country for the purpose of investigating its educational systems.

On behalf of the local members, the Institute was welcomed by Mr. WILLIAM METCALF, and the response on behalf of the Institute was made by its President, Mr. ECKLEY B. COXE. The following is the list of new members elected:

MEMBERS.

Octave Chanute, Chief Engineer N. Y., Lake Erie & W. RR
Luther S. Bent, General Superintendent Pennsylvania Steel Works, Harrisburg, Pa.
George Bartol, Chemist Otis I. and S. Co., Cleveland, O.
Orlando Metcalf, Pittsburg, Pa.
Edwin Harrison, St. Louis, Mo.
Ray Thompson, Troy, N. Y.
Samuel L. Mather, Cleveland, O.
C. Davis, Allegheny, Pa.
Prof. H. B. Nason, Rensselaer Poly. Inst., Troy, N. Y.
Frank P. Howe, Keystone Furnace Co., Reading, Pa.
James W. Neill, New Orleans, La.
Alfred E. Hunt, Nashua I. and S. Co., Nashua, N. H.
William F. Zimmermann, Pittsburg Car-Wheel Works, Allegheny, Pa.
James N. Wright, Supt. Calumet & Hecla mines, Michigan,
Henry R. Worthington, New York.
Joseph Wood, Pennsylvania RR., Altoona, Pa.
William White, Edgar Thomson Steel Works, Braddock's, Pa.
George Webb, Engineer Cambria Iron Works, Johnstown, Pa.
E. C. Van Blarcom, Richmond Consolidated Mining Co., Eureka, Nev.
J. C. Temple, Globe Iron-Works, Dayton, O.
William Swindell, Pittsburg, Pa.
G. A. Steiner, Pittsburg, Pa.
John C. Speer, Pittsburg, Pa.
James S. Cade, Albany & Rensselaer Steel-Works, Troy, N. Y.
Alfred R. C. Silwyn, Director Geological Survey, Montreal, Can.
L. A. Roby, Otis I. and S. Co., Cleveland, O.
John Rinard, Edgar Thomson Steel-Works, Braddock's, Pa.
Henry W. Rathbone, Elmira Rolling-Mill Company, Elmira, N. Y.
Charles S. Price, Johnstown, Pa.
Richard D. A. Parrott, Greenwood Iron-Works, Greenwood, N. Y.
Ferguson G. Parker, Cambria Iron Co., Johnstown, Pa.
William Hamilton Merritt, St. Catharine's, Ont.
William Lilly, Mauch Chunk, Pa.
Alexander J. Leith, Manager Joliet I. and S. Co., Chicago, Ill.
Julian Kennedy, Edgar Thomson Steel-Works, Braddock's, Pa.
Reese James, Johnstown, Pa.
C. C. Hussey, Pittsburg, Pa.
Abraham T. Hay, Burlington, Ia.
William D. Hartupee, Pittsburg, Pa.
Henry Hargreaves, South Pittsburg, Tenn.
Ignatius Hahn, Pittsburg, Pa.
Paul A. Tuyo, Manager Laclede Rolling-Mills, St. Louis, Mo.
Charles L. Fitzhugh, Pittsburg, Pa.
Henry F. De Bardeleben, Birmingham, Ala.
William B. Crocker, New York.
Andrew Cosgriff, Brewster, N. Y.
Theodore Cooper, New York.
James Morgan, American Iron Works, Pittsburg, Pa.
Edward L. Ford, American Iron Works, Pittsburg, Pa.
Albert H. Childs, Allegheny, Pa.

ASSOCIATES.

Horace M. Barry, New York.
W. B. S. Reed, Brooklyn, N. Y.
T. S. Mathis, Windham, Ouray County, Colo.
Edgar Richards, New York City.

CHANGED FROM ASSOCIATE TO MEMBER.

G. B. Cornell, New York City.
W. E. Hildreth, New York City.

Papers were read by Mr. J. M. HARTMAN, on Fire-Brick Stoves; by THOMAS MACFARLANE, on the Classification of Original Rocks; by Professor ROSSITER W. RAYMOND, on Hygiene of Mines; by Professor JOHN A. CHURCH, on Accidents in the Comstock Mines; and by Mr. A. L. HOLLEY, on the Tessié Gas-Producer. Mr. WILLIAM P. SHINN, of Pittsburg, also read a paper on Pittsburg—its Resources and Surroundings.

On Wednesday, the members, accompanied by many ladies, took a steamer for an excursion to the Davis Island dam, now in course of construction; after which, various industrial establishments on the Ohio and the Monongahela were visited. The evening session on Wednesday included, besides the reading of a communication by Mr. A. L. HOLLEY, on the Salisbury Tar-Burning Process, a very animated discussion on Dr. DUDLEY'S paper on Steel Rails, which had been continued from the Baltimore meeting; followed by a paper by Prof. GEORGE W. MAYNARD, of New York, on Thomas and Gilchrist's Process for Developing Iron. Prof. RAYMOND read a short article on the experiments made in England by Mr. SNELUS on dephosphorizing iron in a lime-lined vessel.

Thursday was occupied with an excursion to the works on the line of the Alleghany Valley Railroad. The reception in the evening, at Mr. WILLIAM P. SHINN'S residence, some five miles from Pittsburg, was very brilliant, and was characterized by a happy surprise to Mr. A. L. HOLLEY, an account of which will appear next week. The subscription banquet, Thursday night, attended by one hundred and twenty-five persons, twenty-five of whom were ladies, was a magnificent affair.

## UTAH MINERAL WAX.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: Your issue of April 5th contains a letter from Professor Henry Wurtz, which is a reply to, and a criticism of, my article on the Utah mineral wax, published March 22d. In his letter, Professor Wurtz states that a "rough challenge" has been thrown to him—a challenge which he first imagines, and then accepts with Hibernian alacrity, and makes it the excuse for an unfair and bitter attack. All the tone and many of the statements of Professor Wurtz's letter are entirely unwarranted and unworthy of him. No challenge, rough or smooth, was offered him; and the fact that he regards the publication of experimental results and conclusions differing from his own as a warrant for abuse and misrepresentation, shows a constitutional unfitness to take part in a scientific discussion.

No one who reads my letter, published in your issue of March 22d, will find there any record to the effect that, in order to bring the Utah mineral into complete solution, it was "boiled with ether for 24 hours." This imaginary assertion furnishes Professor W. with material for much derision. The statement actually made was, that the wax was treated with *cold* ether for twenty-four hours, and "upon boiling the undissolved portion in about 500 c.c. of ether, the whole mass went into solution." Not over five minutes were required to produce this result, and this demonstration of complete solubility, together with the low fusing-point of this fraction, 67°, seemed to me to furnish conclusive evidence that that mineral contains nothing bearing any resemblance to zietrisikite. However, Prof. Wurtz says the Utah mineral wax is probably a "lower member of the Zietrisikite Series." As the existence of such a series is clearly his own discovery, and as he has not as yet given to the public any outline of the observations which have led to it, the question is as yet hardly open to discussion. It seems, however, almost premature to decide that the less fusible and soluble varieties of mineral wax constitute a different chemical series from those called ozocerites, while no one has as yet separated these substances into the definite chemical compounds of which they are made up. Until this is done, we can have no reason to doubt that the minerals in question are mixtures of different homologues of the paraffine or olefine series, or both, and present differences in fusibility and

solubility according as the higher or lower members predominate. It is evident, from the record of Prof. Wurtz's experiments, that the observation of purely physical properties has led to the creation of his "Zietrisikite Series," and it is a well-known fact that the physical properties of organic bodies give indication merely of the number of carbon atoms, not of the manner of their grouping in the molecule. And yet Prof. W. speaks of "parallel series," "series differing by other increments than $CH_2$," etc., etc., as if he were very familiar with the molecular structure of these minerals, hitherto so little studied.

The mode of occurrence of these hydrocarbons throws some light upon their probable chemical nature; for they are always associated with petroleum, and are deposited from it, according to the best authorities, by evaporation under certain peculiar circumstances. In petroleum we find members of the paraffine series, olefine series, aromatic series, etc. From a source of such a character we should naturally expect a mixed deposit, the nature of which would depend upon that of the original petroleum. It would be absurd to give specific mineralogical names to different varieties of crude petroleum, to attempt to identify these by ultimate analysis, or to discover new chemical groups by the observation of the physical properties of certain specimens. There is no question that the "ceroid minerals" are also mixtures, though perhaps of not so complex a character as petroleum. For this reason I did not attach any special importance to my analysis of the Utah mineral; for I do not consider that it gives any more indication of the series to which the different constituents of this substance belong than ultimate analysis would give of the chemical nature of an asphalt or a crude petroleum. Prof. Wurtz, however, makes immediate use of the figures I obtained; for he has averaged them with fourteen analyses of European specimens (from the mean of which my figures differ by nearly 1½ per cent in the amount of carbon), and makes the astonishing discovery that the result indicates "the precise theoretical figures for an olefine"! Before my analysis was made, this original method of chemical research would have led to somewhat different results, and it is perhaps desirable that no more analyses of new varieties of mineral wax should be made, lest by some slight disagreement they should disturb the harmony of this beautiful and complete demonstration.

The effect of "predisposing hypothesis," which Prof. Wurtz points out in my letter, is plainly imaginary; for I did not uphold the doctrine that the Utah mineral consists of members of the paraffine group, and no word in my letter could be held to indicate that such was my belief. On the contrary, at the time my letter was written I had carried the investigation of the subject much further than Prof. Wurtz seems to have done, and had arrived at conclusions similar to his; but, as he claimed to have "complete evidence" that the materials in question are not paraffines, I hesitated about making known results which seemed to me incomplete and susceptible of different interpretations. Neither did I imply in any way that the investigation was "beyond his ability to forward," although an unpardonable error in his method of research, as shown in his last letter, gives reason for the suspicion, and renders his conclusions worthless. He says: "Both varieties of the Utah mineral are immediately and completely charred by concentrated sulphuric acid, when they are melted therewith." Of course they are; and so they would be if they consisted of pure *paraffines*. It is a well-known fact, and one which I have proved by experiment, that the members of the paraffine group are readily decomposed by conc. $H_2SO_4$, upon the application of a very moderate heat. Schorlemmer, in the *Chemistry of the Carbon Compounds*, page 70, says of the paraffines: "While they are not acted upon in the cold even by a mixture of fuming nitric and sulphuric acids, on the application of heat they are oxidized, even by dilute nitric acid." It is evident, therefore, that Prof. W.'s attempt to separate these two chemical groups by means of hot sulphuric acid—a reagent which produces the same effect upon both—can not be regarded as furnishing "complete evidence."

Hoping to obtain results which should throw some light on this question of a chemical series in this substance, I prepared a mixture of fuming nitric and concentrated sulphuric acids, allowed it to cool, added 50 grams of the Utah wax in thin shavings, and let it stand, with frequent stirring, for some hours. The acid was then drained off through asbestos, and the wax washed quickly with a large quantity of cold water, then boiled with water to remove traces of free acid, and dried at a temperature a little above the point of fusion. The result was a substance closely resembling the original wax in appearance, but more brittle, and having a peculiar, fruit-like odor. Three different samples of this material were prepared, and on analysis were found to agree very closely in composition, the results differing less than 2 per cent, giving a mean of

| | | |
|---|---|---|
| Carbon | 77·99 | per cent. |
| Hydrogen | 12·98 | " |
| Oxygen | 8·88 | " |
| Nitrogen | ·15 | " |
| | 100·00 | |

The amount of nitrogen is so small that it doubtless results either from the formation of nitro-compounds from some slight traces of members of the aromatic series, or from a little free acid not removed. This analysis indicates an approximate formula of $C_{26}H_{50}O_2$. This is not far from the formula of a possible oxidation product of the olefine group; but the quantity of hydrogen is deficient, and as the different analyses agree so closely, I can not attribute this discrepancy to experimental errors. Without doubt this substance is a mixture of oxidized products, and so far my efforts to separate these have not given much indication of their nature. However, the fact that cold acids produce this decided effect upon the Utah mineral gives abundant proof that the latter consists in part at least of substances distinct from paraffines. Further examination will certainly throw light upon the actual character of these substances, and demonstrate fully the presence or absence of representatives of the paraffine group. With grateful appreciation of your kind indulgence,

Respectfully, SPENCER B. NEWBERRY, E.M.

SCHOOL OF MINES, COLUMBIA COLLEGE, NEW YORK, May 11, 1879.

THE BRITISH ALKALI TRADE.—It is stated that during 1862 there were employed in the British alkali trade 10,600 hands, a capital of £2,000,000, and the value of finished products was £2,500,000. The figures during 1876 were 22,000 hands, £7,000,000 capital, and £6,500,000 value of products.

## NOTES ON ZINC SMELTING.

Written for the Engineering and Mining Journal by F. A. Thum.

(*Continued from page* 312.)

From this we see that the chances for an enlargement or improvement of the Belgian furnace are very limited indeed. The capacity of its retorts is narrowly confined by their free suspension over the fire, which hardly permits more than 3½ feet in length for regularly-sized tubular ones; and the wider or higher we make them, the shorter they should be. They can consequently never compete in 24-hour work with the Silesian muffle resting upon a solid support, and therefore made 6 to 7 feet in length and above 2 feet in height.

But this is not all that may be said against the Belgian furnace. The double operation in 24 hours represents, as compared with the Silesian system, a real waste of labor, and at the same time a two-fold source of loss in zinc, the vapors of which under atmospheric pressure can only be driven out to a certain extent. Every retort retains some zinc vapors, greater or less according to the size of cavities formed in the charge during the distillation, or, in other words, according to the richness of the ore and the porosity of the coke from the coal of the charge. The more retorts in use for a certain quantity of ore and the more frequently they are discharged, the greater must be the loss of metal. It is true that this drawback of the Belgian furnace has hardly been perceptible in its results as compared with the Silesian, chiefly on account of the force with which the charge is generally pressed into the Belgian retort, while the muffle is erroneously charged in the contrary way.

A further drawback of the Belgian furnace is the greater impurity of its product. The receiver, the clay pipe in which the zinc condenses or collects, is only a sort of prolongation of the Belgian retort, on the inclined bottom of which any other liquid metal besides zinc, especially lead, may freely run, even without volatilization, into the receiver. Such a thing is impossible in the Silesian furnace, and it must be added that in collecting zinc from a Belgian furnace the contact of the hot metal with the iron tools is necessarily more intimate than in the Silesian system; because, if it requires 20 receivers to scrape together 1 cwt. of zinc, the latter has more chances to take iron up from the tools than if 4 or 5 receivers yield that quantity; and besides this, there is always more drop- and scrape-zinc to melt together at the Belgian than at the Silesian furnace.

After all this, I feel justified in giving, under all circumstances, the preference to the Silesian furnace, but excluding the double rows of muffles (one above another) as we meet with them in Belgium and on the Rhine. It is the great advantage of the Silesian system that its retorts rest upon a solid base, and may consequently be of great length; but as soon as we suspend a second row above the bottom one, we lose that advantage again by limiting the length of all muffles, and we fall into the same mistake as the Belgian furnace with 24-hour runs. All through Silesia, no double-rowed furnaces are employed; still we find the daily charges of their furnaces as large or even larger than in Belgium and on the Rhine, simply on account of the much greater capacity (height and length) of their muffles; the advantages, however, of a single-banked Silesian furnace are evident—the whole arrangement is simpler and much more durable, and the manipulation for the workmen much easier than at the double-banked furnace.

As already mentioned, the Silesian furnace of former years has been much enlarged, and thus improved. There is, of course, a good deal to say against such enlargement, chiefly in that with the size of the furnace the responsibility of the attending workmen increases, the durability of the furnace decreases, and its manipulation becomes more and more difficult. These objections are not without foundation, and have justly checked for many years the general use of large furnaces, but only while their heating remained confined to direct fire. With the general use of gas, so very successfully applied to the Silesian zinc furnace in late years, most of these objections are overthrown. It is clear that formerly, with the enlargement of the furnace and the fire-grate, the difficulty of its proper attention had to be increased, and in order to heat sufficiently all remote parts of a large furnace by means of a central fire-place, the portion nearest to the fire was destroyed by the action of the heat and the impurities of the fuel more quickly than in a small furnace. Its durability therefore diminished, while the cost of commencing a new campaign increased proportionately with the size of the furnace. However, by means of gas-firing, the durability of the largest furnaces is now much greater than that of the small ones ever was. The former quick destruction of the part surrounding the fire-place, in consequence of which, after a short time, many of the muffles lost their proper supports and failed, is almost entirely done away with, and the firing is much simplified, more under control, and less dependent on the quality of the fuel than in the old grate-furnaces. On the whole, we have to acknowledge the use of gas-firing for zinc smelting as a great progress.

We know that the idea of using gas for heating purposes in industrial enterprises is by no means new. The first trials in that direction may be traced back to the last century. The fact that every fuel is transformed into the gaseous state before its combustion takes place, and the daily experience of the destructive action of the incombustible impurities of fuel upon the furnaces, and their otherwise injurious effect in many metallurgical processes, made it long ago appear very desirous to avoid a direct contact of the raw fuel with the place of heating operation, by transforming it first into gas in an easily-repaired generator or producer. The endeavors in this direction for a long time bore little or no success, especially when generator and furnace were kept entirely separate from each other, which no doubt is one of the greatest advantages connected with gas-firing, though frequently not sufficiently acknowledged. The temperature attained in those earlier trials with gas-heating was not constant, and seldom high enough for any metallurgical purpose. We know to-day that the heating power of the gas was originally overestimated. In many cases, it was badly produced, and was burned without regard to pressure. The only satisfactory results of these trials were those obtained by applying blast to the generator, the construction of which remained for a long time defective. We may call every fire-place of sufficient depth to produce an imperfect combustion of the fuel, resulting chiefly in carbonic oxide, a gas generator. A comparatively large quantity of fuel has to be

operated on, and the construction of the generator ought to allow the charging, the separation of the slags and clinkers, and their easy removal, without interfering with the regular march of the process and the quality of its produ t. These are principles generally known; but, strange to say, we find them very frequently neglected even in our day.

It is due to Siemens to say that, along with his system of regeneration, he first introduced a gas-producer which, more than any preceding one, answered these conditions. The chief impulse to gas-firing was undoubtedly given by Siemens; not so much, however, by his gas-producer as by his excellent method of utilizing the waste heat for increasing and regulating the temperature of the combustion of the gas.

In the Siemens system, the waste gases of combustion are led through two chambers fitted with fire-bricks, built up with spaces between them; they give up their heat in those chambers and enter smokeless and almost cold into the chimney. Meanwhile the feeding currents of fresh gas and air are passing through a second pair of chambers, previously heated up by the waste flame, and in such way attain a high temperature (about 700° for air and 850° for gas), before reaching the furnace. By means of valves, arranged outside the furnace, the circulation of the gases may easily be reversed after shorter or longer intervals of time, the access of gas and air may be regulated, and the intensity of the heat as well as its chemical character can be kept under control. The attainable temperature exceeds that of any other practical heating apparatus. It only seems limited by the law of dissociation, according to which chemical affinity or action ceases altogether at a certain high degree of heat. Moreover, the whole arrangement is a solid one: the reversing valves, the only delicate part in it, may be kept almost entirely out of reach of the heat. It avoids the use of blast, with all its incumbrance and costliness. To this must be added the economy in the use of fuel, and the advantage of securing with almost any sort of fuel a temperature sufficient for most metallurgical processes. The nature of the fuel can only influence the construction of the gas-producer, which is quite independent of the system, and the form commonly seen in connection with it must be modified in accordance with the quality of the fuel. After all these advantages of Siemens's regenerative system, it appears only just to enumerate the things that may be said against it. This will at the same time give an opportunity to follow the principles of some of the newer systems, the advocates of which generally dwell upon their successfully obviating the drawbacks of Siemens's design.

In the regenerative Siemens system, the gas is produced in perfectly detached generators, and has to be cooled down to about 150°–200° before it passes through the valves into the brick chambers, and subsequently into the furnace. In such manner the valves are kept in safety from the destructive action of the heat, and the contraction of the gas, in consequence of its cooling, causes, independently of the draught of the chimney, a strong current of the gas toward the furnace, and a small excess of pressure over that of the atmosphere. In order to keep as independently as possible from the atmospheric variations, it is always advisable to erect the gas-producer upon a lower level than the furnace. Now this arrangement involves a certain not inconsiderable loss of heating power and of gas itself. In the first place, all the gas which fills the regenerative chamber and the passage up to the valve at the moment of reversing the latter is lost, unless the temperature of the brick chamber be still high enough and the excess of air in the waste gases be sufficient to permit of its combustion within the chambers. Another loss of heat necessarily comes from the detached position of the producer and from the intentional cooling of the gas, frequently causing at the same time a troublesome accumulation of tar, against which, however, simple precautions may be provided. If we take heating gas, resulting from coal, on an average as composed of

| | Volumes. | Per cubic meter. Weight. | Heating power |
|---|---|---|---|
| Carbonic oxide | 27·00 | 0·3286 k × | 2,400 = 788·64 c |
| Carbonic acid | 3·35 | 0·0663 | |
| Olefiant gas | 0·70 | 0·0089 × | 11,900 = 105·91 |
| Marsh-gas | 3·30 | 0·0239 × | 13,000 = 310·70 |
| Hydrogen | 2·00 | 0·0018 × | 34,400 = 61·92 |
| Nitrogen | 63·65 | 0·8020 | |
| | 100·00 | 1·2315 k | 1267·17 c |

we receive 1267·17 calories of heating power per cubic meter of coal-gas. Supposing the full heat to be gained by perfect combustion of the carbon of coal into carbonic acid—which is altogether impossible—the total heating power equivalent to 1 cb. m. of gas would then be 1762·44 cal. Hence, 1762·44 — 1267·17 = 495·27 cal., or 28 per cent of the whole appears to be lost in the operation. Considering on the other hand, that the temperature of the gas is raised within the regenerative chambers to 850° before it enters into combustion, its heating power is accordingly raised 850 × 0·3154* = 268·09 cal. per cb. m., or 15 per cent, so that only 13 per cent may be considered as really lost in comparison with other gas-firing systems.

This undeniable waste of heat, and more perhaps the fact that the Siemens system requires a somewhat scientific treatment and can not be roughed, has led to several modifications and new arrangements. The simplest of all is the use of gaseous fuel without any regeneration at all, and to attain the necessary high degree of temperature during its combustion by pressure, namely, by applying blast under the producer as well as in the furnace. This plan has been extensively adopted for zinc furnaces in Silesia, successfully even with a perfect detachment of the producer from the furnace, and with steam jet blowers. The moisture of the blast of such apparatus naturally absorbs a large amount of heat and reduces the temperature; still, with sufficient pressure, a high temperature may be obtained. Such an arrangement also allows the use of a low quality of coal; but the consumption of fuel is much greater than in Siemens's furnaces—at least 20 to 25 per cent greater.

(TO BE CONTINUED.)

* The specific heat of the above gases per cb. m.:

| | |
|---|---|
| CO | 0·3286 × 0·2479 = 0·0815 |
| $CO_2$ | 0·0663 × 0·2164 = 0·0143 |
| CH | 0·0089 × 0·4040 = 0·0036 |
| $CH_2$ | 0·0239 × 0·5929 = 0·0142 |
| H | 0·0018 × 3·4046 = 0·0061 |
| N | 0·8020 × 0·2440 = 0·1957 |
| | 1·2315 0·3154 |

## ON THE METHOD OF EXTRACTING GOLD, SILVER, AND OTHER METALS FROM PYRITES.*

By W. A. Dixon, F.C.S., Cor. Mem. Nat. Hist. Soc. Glasgow.

Some years since, Mr. Wood, Under-Secretary for Mines, suggested to me that the extraction of gold from complex minerals was a subject well worthy of investigation, and one which, if brought to a successful issue, would be of great value to New South Wales and Queensland. Both these colonies yield minerals containing gold, and that often in considerable quantity, but so mixed up with sulphides of copper, lead, iron, and other metals, that none of the ordinary methods of treatment extract more than a very small proportion of it.

Acting on this suggestion, I obtained some pyrites from Mariner's Reef, Gympie, which in the rough yielded on analysis: Copper, 6·2 per cent; lead, 0·19 per cent; gold, 3 ozs. 3 dwts. 2 grs. per ton; silver, 32 ozs. 9 dwts. 3 grs. per ton.

Another larger portion from the same reef, after being ground and washed so as to remove as much as possible of the quartz, which was found to amount to about 60 per cent of the rough mineral, gave:

| | | or | | |
|---|---|---|---|---|
| Copper | 17·02 | | Copper pyrites | 48·45 |
| Lead | 2·01 | | Iron " | 35·95 |
| Antimony | 3·90 | | Galena | 2·31 |
| Gold and silver | 0·22 | | Sulphide of antimony | 5·44 |
| Iron | 31·41 | | Sulphide of arsenic | 0·68 |
| Sulphur | 37·86 | | Gold and silver | 0·22 |
| Silica | 7·16 | | Silica | 7·16 |
| Arsenic and loss | 0·42 | | | |
| | 100·00 | | | 100·21 |

Gold 12 ozs. 10 dwts. 0 grs. } per ton.
Silver 62 ozs. 9 dwts. 16 grs. }

I had also a small lot of copper pyrites, from this colony, containing 24 per cent of copper, and gold equal to 78 ozs. 8 dwts., and silver 4 ozs. 2 dwts. 10 grs. per ton; arsenical pyrites, containing, when thoroughly roasted, 11 ozs. 18 dwts. 0 gr. per ton; iron pyrites, containing, when roasted, 5 ozs. 6 dwts. 3 grs. gold per ton.

As much attention has been given by others more conversant than myself with mechanical manipulation to the extraction of gold and silver, by grinding with mercury in variously designed apparatus, with comparatively small success so far as these complex ores are concerned, I have confined my attention principally to those chemical relations of gold which would enable me to obtain it in solution. I may note, however, that in Germany ores containing more than 1 per cent of copper, or 7 per cent of lead, have not been found suitable for amalgamation; and that an increase of density of the accompanying gangue from the presence of heavy-spar, etc., or of tenacity from the presence of clay, seriously reduces the yield of precious metals, consisting in their case principally of silver; and that nearly all the gold is lost in the tailings, with about 15 ounces of mercury per ton of ore treated.

The loss of silver by amalgamation, working with ores considered suitable for that process, has been found to vary in Germany from 5 to 10 per cent of the contained quantity.†

With the Comstock silver ores in America, the loss is 12 per cent by barrel amalgamation; while with the same ores by pan amalgamation the yield never exceeded 80 per cent, seldom 75 per cent, with a general average of 66 per cent.‡

At the Port Phillips Works, at Clunes, Mr. Latta reports that the average loss of gold by amalgamation in a period of seven years was 6 dwts. 10 grs. per ton, the highest loss being 7 dwts. 15 grs.; the lowest, 4 dwts. 8 grs., the pyrites being free, or nearly so, from copper and lead.§

In treatment by fusion, it is found at Kongsbeck, in Norway, that after repeated fusion slags carry away 1 oz. 2 dwts. of auriferous silver per ton; and in Lower Hungary, by a similar process, the loss is in the slags 1 oz. 12 dwts. per ton, besides a loss of 3½ per cent of the total silver in the smoke.

Rivot says: "The yield of gold and silver from pyritical ores does not exceed 65 per cent of the assay, which is itself open to losses. According to many synthetical experiments, the loss is greater in assays of richer than of poor ores, amounting always to more than 30 per cent, and, with fahlore and ores containing arsenical pyrites, to more than 50 per cent. The loss incurred when working on a large scale is less than in laboratory assays. The difference between the yield on the large scale and the percentage by assay may exceed 30 per cent, even when the metallurgic method is quite perfect; but as the American methods are far from perfect, the difference is still greater."‖

Many of the trials made during this investigation yielded negative results, and in others the yield of the precious metals was so small as to be of no practical value, and I shall therefore only give an outline of the methods adopted, with a few results selected from numerous experiments.

The quantity of material operated on in all cases was 3667 grains, from which quantity one tenth grain represents 1 ounce per ton.

The first process which suggested itself for the extraction of gold was to take advantage of the solubility of sulphide of gold in solutions of alkaline sulphide; for, if this could be effected, it would render the roasting of the ores unnecessary.

In 1859, Henderson included in his patent for the extraction of copper, a process for extracting gold as sulphide. His directions are, that the pyrites be fused to obtain a matte which is to be fused with two parts of salt cake (crude sulphate of sodium), and the matte run into pigs. These, placed in water, crumble to pieces; and the gold is obtained in solution, whence it may be recovered by precipitation with an acid.

In 1868, a process was patented in America for the extraction of gold by "sulphur and its salts;" but of this I have no details.

The first experiments were made by treating portions of each ore with solution of sulphide of sodium, containing a slight excess of sulphur. The experiments were varied in concentration of solution, in time of di-

* A paper read before the Royal Society of N. S. W., August 1st, 1877; and published in the *Chemical News*, London, December 13th, 1878.

†Watts's *Dictionary of Chemistry*; article, "Silver."

‡S. A. Phillips's *Mining and Metallurgy of Gold and Silver.*

§Transactions Royal Society, N. S. W.

‖Rivot, *Ann. Min.* [6] vii. 1. Watts's *Dictionary of Chemistry*, Second Supplement, p. 572.

gestion from one to seven days, and in temperature, some being conducted at ordinary temperatures, others at 212° Fahr. Twenty experiments were made altogether, and in no case was a trace of gold obtained on neutralizing with acid, filtering off the precipitated sulphur, and igniting. From arsenical pyrites much arsenic was obtained in solution.

Henderson's process was tried with Mariner's Reef ore, proceeding exactly according to his directions; but although the regulus disintegrated in water as described by him, I could not, in two trials, obtain any gold in solution. This process was modified, with equally unsatisfactory results, by fusing with sulphide of sodium, by fusion with sulphate of sodium and charcoal, and by heating finely-powdered ore to a dull red with sulphite of sodium, without fusion.

The extraction of gold from its ores as chloride was proposed by Price, who, in January, 1857, patented a process in America for the extraction of gold from its ores by fusing them with sulphide of iron, and treating the regulus with aqueous chlorine or an acidified hypochlorite. This introduced a source of difficulty, as the chlorine would have to convert the sulphide into ferric sulphate before any gold could be obtained in solution.

Ziervogel proposed treating roasted pyrites with chlorine, and his process was used at Chemnitz.

This process was afterward patented in the United States by G. F. Deetken, in 1863, and has been used with tolerably satisfactory results in California in two establishments. The process is there carried out as follows: The concentrated pyrites are subjected to a thorough calcination, and when sulphurous anhydride ceases to be evolved, the residue is withdrawn from the furnace and cooled. It is then sprinkled with water, and turned over several times until uniformly damped, the exact condition in this respect being a matter of considerable importance. It is then placed in a large wooden vat, having a false bottom, and chlorine gas from a generator is admitted below until it is seen floating above the material. The tank is then closed, the current of gas stopped, and the whole left at rest for ten or twelve hours, when the cover is removed, and water is run on. This dissolves the chloride of gold formed, and the solution is run into earthenware or glass vessels, where the gold is precipitated as a bronze-black powder by the addition of a solution of ferrous powder.

As it had been found that gold alloyed with much silver was not readily attacked by chlorine from the chloride of silver formed incrusting the granules, Paterno, and afterward Rösner, proposed the use of chlorine dissolved in a concentrated solution of salt.

The disadvantage of the chlorine method of extraction is, that with ores containing copper the whole of that metal has to be removed before the chlorine becomes available, and also all the sulphur which otherwise becomes first oxidized to sulphuric acid.

With a view to removing the copper, I carefully roasted a quantity of ore in a muffle, at a dull-red heat, with constant stirring for seven hours, and extracted the residue with water and sufficient sulphuric acid to convert all oxide of copper into sulphate. The dried residue was found to contain 1·5 per cent of sulphur; and I therefore re-calcined the whole for seven hours longer, and extracted the copper as before, when the sulphur was found to be reduced to 0·46 per cent. A similar result was obtained in successive trials, and as this amount of sulphur would require as much chlorine as upward of 3300 ounces of gold per ton, a more perfect method of getting rid of it was evidently required.

Another portion of ore was therefore partially calcined, cooled, and damped with brine, and the whole again calcined until fumes were no longer evolved.

The residue, extracted with water and acid as before, was found to contain 0·12 per cent of sulphur, and traces only of copper.

On assaying a portion of the residue, it was found to contain:

Gold..... 3 ozs. 14 dwts. 8 grs. per ton.
Silver..... 39 ozs. 18 dwts. 14 grs. per ton.

A portion was ground up with mercury, and sufficient water to make it of the consistence of thick cream, in which the mercury was well broken up for an hour, and afterward carefully washed, the tailings being gone over as often as any mercury was found. This yielded:

Gold..... 1 oz. 0 dwt. 5 grs., leaving 2 ozs. 14 dwts. 3 grs.
Silver..... 6 ozs. 16 dwts. 10 grs., " 33 ozs. 2 dwts. 4 grs.

Another portion, shaken up with a solution of salt and pieces of iron to decompose the chloride of silver, and the residue ground up as before, yielded:

Gold..... 1 oz. 1 dwt. 0 gr., leaving 2 ozs. 15 dwts. 8 grs.
Silver..... 34 ozs. 3 dwts. 5 grs., " 5 ozs. 15 dwts. 9 grs.

These results showing that even after the most complete removal of sulphur, or at all events what would be considered complete on the large scale, the greater part of the gold present was untouched by the mercury, I proceeded to examine the effect of chlorine, of which I give the following as typical results:

A portion treated with chlorine gas exactly as above described yielded gold, 16 dwts. 10 grs., leaving 2 ozs. 17 dwts. 22 grs.

A portion treated with ¾ oz. of calcium hypochlorite and sulphuric acid, with sufficient water shaken up in a bottle for twenty-four hours (it then smelt strongly of chlorine), was filtered through an asbestos filter, the residue well washed, and the gold precipitated—yielded 1 oz., leaving 2 ozs. 14 dwts. 8 grs. The dried residue was found to be free from sulphur.

A portion mixed with brine and the same quantity of reagents as above, and otherwise similarly treated, yielded gold 1 oz. 2 dwts. 5 grs., leaving 2 ozs. 12 dwts. 3 grs. The residue, digested with water, containing ½ oz. hyposulphite of sodium, the solution acidified and treated with sulphureted hydrogen, gave—

| | Ozs. | Dwts. | Grs. |
|---|---|---|---|
| Gold | 22 | 14 | 19 |
| Silver | 0 | 3 | 0 |

Roasted arsenical pyrites, treated with hypochlorite of calcium and sulphuric acid as above, gave—gold, 11 ozs. 15 dwts. 5 grs., leaving 2 dwts. 19 grs. Roasted iron pyrites, similarly treated, gave—gold, 5 ozs. 1 dwt., leaving 5 dwts. 3 grs.

The last two results show that with these simple pyrites the treatment with hypochlorite and acid gives very fair results; and this being a process involving no troublesome apparatus, it might be sometimes applied with advantage.

(TO BE CONTINUED.)

## LEAD AND COPPER PRODUCTION.

A correspondent in the London *Mining Journal* of May 3d says:

"The lead-producing capacity of the United States is stated to be 160,000 tons of metal per annum; the consumption is alleged to be 80,000 tons; consequently there is a margin of 20,000 tons for export purposes. This lead (100,000 tons) is largely derived from what the Americans term, in their 'highfalutin' language, lead bullion; or, rendered into English, silver-lead ore. In Germany there are mines which produce lead at £10 per ton. From the plumbiferous sandstones of Mechernich lead is produced at £12 per ton, one mine alone making 60 tons of metal per day. These sandstones afford from 2 to 3 per cent of lead. The plumbiferous sandstone measures of Bavaria will shortly be worked by an English company, when lead will probably be produced in unusually large quantities at about £10 per ton, including the cost of mining and smelting. With regard to copper, the prospect of high prices in the future is all but closed. Fifteen years ago, only a limited quantity of copper was obtained from the Spanish and Portuguese pyrites; now the production is 30,000 tons yearly. These ores contain on an average less than 3 per cent of copper, of which barely two thirds is obtained—say, 2 units per ton. The approximate produce of ore from three of the chief mines in 1877 was as follows:

| | Ore treated at mines. Tons. | Ore exported. Tons. | Total. Tons. |
|---|---|---|---|
| Rio Tinto | 420,391 | 251,360 | 771,751 |
| Tharsis and Catanas | 231,992 | 249,299 | 481,291 |
| San Domingos | 178,000 | 163,000 | 341,000 |
| Total | 930,383 | 663,659 | 1,594,042 |

Besides copper, the pyrites give about 46 per cent of sulphur, 40 per cent of iron, traces of zinc, arsenic, and lead. In addition, the San Domingos cinder ore contains 15 to 18 dwts. of silver per ton, and the Rio Tinto 1¾ ozs. A few grains of gold per ton are also associated with all Spanish and Portuguese ores. The quantity of copper now derived from Spanish pyrites alone is nearly seven times that obtained from the whole of the ores raised in the United Kingdom. America will also, in a short time, add materially to her copper production. The wet process of extraction is one likely to find much favor in that country.

"At the Spanish and Portuguese mines, the ores are simply roasted in open heaps; the copper converted into a sulphate, the latter washed out of the ore, and the metal precipitated by means of metallic iron. In this country, the burnt ore obtained from the pyrites is ground and sifted, then roasted with about 12 per cent of common salt, and the copper sulphide is converted into a soluble chloride. This copper salt is then removed by repeated washings with water, and the copper precipitated in a metallic condition by means of scrap-iron. The silver present in the ore is mostly obtained by Claudet's process."

## OPERATIONS AT THE RIO TINTO MINES IN 1878.

We extract the following from the Directors' report:

"Produce of the mines: Pyrites: The quantities extracted were in tons—In 1877, for shipment, 251,360; for extraction of copper by local treatment, 520,391; total, 771,751. In 1878, for shipment, 218,818; for extraction of copper by local treatment, 652,289; total, 871,107. The quality of the mineral shipped has been well kept up by the system of selection adverted to in last report; the average copper contents has maintained the improvement then mentioned. The actual consumption of this company's pyrites has been 211,403 tons, which is almost identical with the previous year. The continued depression in the chemical trade during 1878 has operated adversely to any increase in the quantity of pyrites sold and delivered. The company was, however, in a position to have augmented its output and shipments in 1878 had the markets required larger supplies. The sales for the current year amount to 240,000 tons, a portion of which will reap the benefit of the arrangement reported last year as having been made with the other importers. Copper: The last year's report held out the anticipation that the produce of metallic copper by local treatment at the mines would reach 4900 tons. This anticipation has been fulfilled, and the quantity actually made was 4006 tons, of 1000 kilograms, equivalent to 4416 tons, of 21 cwt. net, after allowance for draught and moisture. It must be remembered that in 1878 the plant and appliances for the production of copper, begun during previous years, were by no means completed, so that the 4416 tons of 1878 afford no just criterion for the probable production of the present and succeeding years. This is shown by the fact that the production of the four months of 1879 ending April 30th, or one third of the year, amounts to 2385 tons, of 21 cwt. net. So much being thus already secured and a good water supply in store, your directors feel justified in expecting that the locally-made copper in 1879 will exceed that of 1878 by not less than 2000 tons. The quantities brought to market and realized, were: In 1876, 976 tons, of 21 cwt. net, metallic copper; in 1877, 2495 tons, of 21 cwt. net, metallic copper; in 1878, 4184 tons, of 21 cwt. net, metallic copper."

Mr. E. T. COPELAND advises us that he is again offering the "Alden" Crusher, having compromised with the Blake Crusher Co., and that he will carry a stock in this city and Cleveland, Ohio. He has received the following testimonial concerning his No. 6 crusher, which has a receiver capacity 12″ × 5″, is sold at $1000, and weighs 10,000 lbs.:

E. T. COPELAND, 30 Cortlandt street, New York:

DEAR SIR: In reply to your inquiry as to the working of the Alden Crusher we purchased of you last year (June, 1878), we have used it to crush the Lake Superior iron ores. Among them is the "Jackson" brown ore. This is the hardest of all the ores, and very destructive to machinery. With the Alden we reduce upward of a ton per hour as fine as lake sand. On "Rossie" and hematite, they being softer (when the ore is dry), it requires two men to feed it. With the present jaw-faces we have crushed over two hundred tons, and they are good for as much more. Truly yours, (Signed) IRON-CLAD PAINT CO.,

CLEVELAND, O., May 5, 1879. S. M. CARPENTER, President.

## STEEL FROM CLEVELAND (ENG.) ORES.

London *Engineering*, in speaking of Messrs. Thomas and Gilchrist's process of dephosphorizing iron, says :

"It has been said in the press over and over again that the invention consists simply of a new magnesian lime lining for the Bessemer converter, which lining, having an affinity for the phosphorus, absorbs it from the iron ; and the success of the invention has been supposed to depend upon how long this lining would bear the intense heat of the converter without being destroyed, and without becoming charged with phosphorus to such an extent as to lose its virtue. This description is, however, by no means correct. The new lining does not, as a matter of fact, absorb the phosphorus, and hence the fear of its failing through becoming charged with the latter is purely imaginary. The only enemy to the new lining is the intense heat, and this it has been found as capable of withstanding as the ordinary ganister lining, or even, it is said, better. The invention is in point of fact, like all great and useful inventions, extremely simple in its conception, and is based on well-known chemical and metallurgical laws, and the difficulties met with were those incident to carrying it out successfully in practice. The latter have occupied the skill and exercised the patience and energy of the inventors during the last six or seven years, and the circumstances which eventually attended the introduction of their labors to the world, some of which we shall briefly refer to in the sequel, are in many respects peculiar, and will, we venture to predict, constitute hereafter an interesting chapter in metallurgical history.

"We shall perhaps best be able to make the process of Messrs. Thomas and Gilchrist, as it is carried out by Messrs. Bolckow, Vaughan & Co., clear to our readers by describing first what occurs in the ordinary mode of making Bessemer steel from hematite ores or pigs. This may be put as follows : The molten iron from the blast-furnace or cupola is run into the Bessemer converters without any other admixture, and the blast is turned on, when, by forcing cold atmospheric air at a high pressure through the fluid iron by a number of small holes or tuyeres in the bottom of the converter, the carbon and silicon, together with other impurities, are driven or burnt out of the iron. The carbon becomes oxidized, and passes off as an inflammable gas, the variations in the color of its flame, especially toward the end of the blow, indicating the stage of decarbonization at which the metal has arrived. Simultaneously with the escape of the carbon, the silicon is oxidized, and combines with a portion of the iron also oxidized to form a slag or scoria which floats on the surface of the molten metal. Whatever phosphorus there is in the iron remains there, and it has hitherto been found impossible in the Bessemer converter to 'blow' it out.

"The slag so formed is of a siliceous or acid nature, and offers no means of escape to the phosphorus, because phosphoric acid, in its nascent state, unless it has a strong base to unite with, relapses to its original condition and remains combined with the iron as a phosphide. Silica, it should be added, at high temperatures, is a more powerful acid than phosphoric acid, and in point of fact prevents the latter from combining with the oxide of iron in the slag.

"Under these conditions, Bessemer steel has always hitherto been made, and the same remark, so far as the acid nature of the slag is concerned, applies to the manufacture of steel in the Siemens-Martin and all open-hearth furnaces.

"In the early days of the Bessemer converter, this acid slag, combined with the intensely high temperature, rendered it difficult to find a lining which would stand the work satisfactorily ; but the ganister lining was soon found to give good results, and has been employed ever since. The ganister lining is itself a siliceous or acid material, like the ordinary slag, and consequently, so long as it could stand the heat and the movement of the metal, it answered its purpose.

"Messrs. Thomas and Gilchrist recognized the fact that, so long as there was an acid slag in the Bessemer converter, the removal of the phosphorus there would be an impossibility, and they contemplated the conversion of this acid or siliceous slag into a calcareous or magnesian basic slag. Such a slag would afford a base with which the nascent phosphoric acid could combine, and thus enable it to be eliminated from the iron. This, it was seen, could be done ; but then came the difficulty with the lining. A ganister lining, being siliceous or acid, would be eaten away by a basic slag, and the latter would be itself neutralized at the same time ; so that, to render the contemplated action of the basic slag possible, a basic lining also had to be provided. And this proved the hardest nut to crack.

"Lime linings had been tried before for various kinds of furnaces, and failed. Mr. Snelus, we believe, proposed a lime lining for cupolas and converters about seven years ago, but it failed mechanically ; Dr. Siemens has stated in the *Times* that he also tried a lime lining unsuccessfully. Of course there were two difficulties in the way of these attempts, one being owing to the presence of the acid slag in the converter, and the other owing to the intense heat producing great friability and want of coherence in the lime lining. The very principle, however, which Messrs. Thomas and Gilchrist were pursuing relieved them of the first difficulty, and they were not to be deterred by the latter. After patient investigation and countless experiments, they discovered that they could make an excellent brick out of magnesian limestone containing from 6 to 8 per cent of silica, 3 to 4 per cent of alumina, and 1 to 2 per cent of oxide of iron, by firing it at a very high temperature, ordinary fire-brick kiln temperatures being insufficient.

"This, although apparently a matter of detail rather than of principle, was the turning-point of their discovery. Many difficulties still remained with these bricks, owing to their enormous shrinkage tending to crack them. The shrinkage in volume is, we believe, from 40 to 50 per cent, and arises, we may suppose, in great part from a new chemical formation of aluminates, silicates, and probably ferrates ; the bricks becoming exceedingly hard and dense. The difficulty of the cracking has now been overcome, and, once fired, there is no after expansion or contraction.

"We may now describe the process. As at present conducted at Messrs. Bolckow, Vaughan & Co.'s works at Middlesbrough, the steel is made from Cleveland ore in 2-ton converters. These converters are lined with the highly-fired magnesian lime bricks before described. We may mention that at Eston, Dowlais, and elsewhere, brick linings have been adopted and found better than rammed ones. Into the converter, before the molten metal is run in, is placed a certain quantity of lime, carefully weighed, and in proportion, of course, to the silicon and phosphorus in the iron, of which the influence on the slag has to be neutralized. The metal is then run in, and the blowing commences in the usual way. After the blow has proceeded some time, a further quantity of lime mixed with oxide of iron is put into the converter, and the blow proceeded with until the operation is finished. Toward the end of the blow, samples of the iron and the slag are taken out for examination ; but this, we understand, is only contemplated during what may still be termed the experimental stage, when accurate information as to what goes on within the converter is above all things necessary. When the blow is completed, spiegeleisen is put into the converter, and the metal run out into ingots or castings in the usual way.

"Of the success of the process no one who has seen it at work can doubt, and we understand it will within a week or two be employed on a large scale for commercial purposes at the company's steel works at Eston, where the rail mills are also situated.

"That this invention marks a vast turn in the prospects of the iron and steel trades can not admit of a reasonable doubt. That steel will now soon be made for practically the cost of iron, and will be sold sufficiently near the price of iron to drive the latter out of the market so far as the great industries, such as shipbuilding and engineering are concerned, looks now more than ever like a thing of the immediate future, and should make even the most sanguine iron-makers look their position seriously in the face. That the change, however great the sacrifices of plant it may entail, will tell in favor of the Cleveland district, is also reasonably clear, although no one can count with certainty on an issue so broad and momentous when the inventive faculties of man are awakened in self-defense ; and other changes as vast as the one we have been describing are now being freely discussed, and are not without the bounds of possibility.

"It may be interesting to mention here that it is found that for good working the slag should contain not less than 33 per cent of lime and magnesia, while it generally contains over 40 per cent, and under 20 per cent of silica. In contrast to this, it may be stated that the ordinary Bessemer or Siemens slag contains from 1 to 5 per cent only of lime and magnesia, and over 40 per cent of silica.

"Summing up the process of Messrs. Thomas and Gilchrist, it may be said to consist of (1) the formation of a durable and and 'patchable' lime lining ; and (2) the production of a calcareous or magnesian basic cinder or slag containing under 20 per cent of silica, and certain features in the blowing necessary to reap the full advantage of the above conditions.

"It applies, so far as the slag and lining are concerned, to the Siemens-Martin furnace as well as to the Bessemer converter, and it is being taken up rapidly abroad. It has, we are informed, been tried under Mr. Thomas's instructions at Thy-le-Château in a Ponsard furnace, which is a combination of the Siemens furnace and Bessemer converter, and very admirable results have been obtained when using phosphoretic pig. For open-hearth furnaces, the Pernot furnace is probably the best adapted for this process, as it combines the intense heat of the Siemens regenerators with a movable bottom capable of being got out and got at without lowering entirely the temperature of the furnace, and it can also be kept in motion during the making of a charge, thereby bringing different portions of the metal in contact with the flame, and considerably reducing the time necessary for each charge.

"In all cases there is, as will be seen, only the one process to go through to make steel from Cleveland ores, as at present when hematite ores are used ; and as to the matter of increased cost, there has been, up to the present time, we are informed, an excess over the cost of blowing hematite pig of considerably less than 2s. per ton, and this is likely to be much further reduced when larger converters are employed."

## THE PICTET ARTIFICIAL ICE COMPANY.

The enormous consumption of ice in this country, and the necessity for refrigeration in various manufacturing processes, impart a special interest to any mode by which the supply of ice or cold air may be cheapened. Various chemical agents, as all are aware, are in use in ice-making machines, such as ammonia, ether, gasoline, and methylic oxide their properties of vaporization inducing cold ; several failing to meet all requirements, and others requiring enormous pressure to liquefy them. Other drawbacks exist in liability to corrode metal, and to catch fire. The Pictet process, so named from its inventor, Mr. Raoul Pictet, and based on the use of anhydrous sulphurous oxide, has been brought very fully to general attention at recent international exhibitions and by its satisfactory working in British, continental, and American establishments.

A company has been formed in New York which holds exclusively the United States patents, covering in detail the manufacture of the oxide (formerly extremely costly, but now turned out at a low price) and its application to the production of cold by any machine, preferably the Pictet machinery. This machine produces ice and cold air, separately or concurrently. The liquid, contained in a refrigerator, is vaporized under the ordinary atmospheric pressure by a double-acting pump, furnished with conducting pipes, and which compresses it under a maximum of three atmospheres after circulation into a condenser, where it is liquefied anew to be brought back to the refrigerator. The heat produced by liquefaction is absorbed in the condenser. The circulation of a solution of magnesium chloride, between and around ice-molds, is effected by the motion of a helix, which revolves constantly in the bath. The heat of the tropics and that of the arctic regions are found contiguous to each other in the conducting pipes of the pump. Where ice is produced, the refrigerator is placed below the ice-tanks, so as to utilize the outside surface. The ice proves of great relative durability, due to its crystalline purity and the complete absence of air-holes. Valuable applications of the Pictet process and machinery are to the extraction of paraffine from oil, owing to the great refrigerating surface it provides ; and to chemical works, in which low temperatures are required. The company's head-quarters are at the Coal and Iron Exchange ; but it has opened an extensive refrigerating warehouse at 163 Greenwich street, for the service of New York importers, shippers, and dealers in perishable commodities.

A LONG DIAMOND-DRILL CORE.—In the course of some recent explorations with the diamond drill through limestone and slate, at the Liberty copper mine, Frederick, Maryland, a continuous core was extracted 1⅝ inches in diameter and ten feet in length, without a fracture or break.

## PROGRESS IN SCIENCE AND THE ARTS.

### General Science.

**The Brooks Underground Telegraph** system, the details of which, though familiar to telegraphic engineers, have received but little publicity, appears during the past two years to have been quietly establishing its claims as a simple and effective solution of the problem of underground telegraphy; and, from the developments of the last few days, it is very probable that it may soon come into general use, in this country at least, as the statement is made, apparently on good authority, that the exclusive right to the use of the system has been purchased in the interest of the Western Union Company.

The system of Mr. Brooks differs from all others in the fact that the material employed for maintaining the insulation of the line is a liquid—paraffine oil, which is known to possess, for this purpose, qualities of the highest order; and, in laying it, the wires—thirty, forty, or fifty, as may be required—covered with cotton binding, are placed in an iron pipe, conveniently located, and the pipe line filled with oil, allowed to run in until full, the maintenance of the supply being assured by providing an elevated vessel of the material at intervals, so that a constant pressure will be kept within the pipe. This is practically all there is about it, and its extreme simplicity appears to be not the least of its merits, as one of the great objections advanced by the advocates of the post system has been the great expense of laying and maintaining underground lines.

Upon the question of its practical working we now have very good testimony, and this, we are pleased to be able to state, is unqualifiedly favorable. The first line constructed upon this system, and which was actually put to work, was laid about two years ago. It was about a mile in length, and is reported to have been successful beyond all expectations; its insulation at the end of two years having improved rather than deteriorated. The next experiment was made at the instance of the P., W. & B. Railroad, a submerged line being laid across the Schuylkill. It gave good results, and has ever since been in operation, its insulation, like that of its predecessor, having increased. Since that time, a number of lines have been laid: one connecting the switch-boxes with the signal tower of the Pennsylvania Railroad west of the passenger depot in West Philadelphia; another across the Christiana and Brandywine creeks at Wilmington; and two across the Hackensack River, at Jersey City. At the present time, negotiations are pending, according to our authority, for connecting Camden with Philadelphia by a line across the Delaware, for the laying of a line across the Hudson at New York, and for a line between New York and Philadelphia. The advantages of a meritorious and reliable system of underground telegraph over the old aërial system have been so often pointed out in the JOURNAL that their repetition here would be useless. We have simply to record the progress of events from week to week, a task in the case of this item that we perform with peculiar gratification.

**The System of "Telephone Exchanges,"** one of the most useful and practical outgrowths of the introduction of the telephone, appears to be coming into very general use, and to serve an admirable purpose. At first the telephone was limited to short private lines, each operated separately and independently. By the new system, however, a field has been opened for it of practically unlimited extent, and greatly increased utility. As some of our readers may not be aware of the features of this recent development of the telephone, we may state that it consists in the establishment of a central office, from which wires run out into the offices, stores, mills, residences, etc., of the members or subscribers. When one member desires to talk with another, the central office is notified of the fact, his wire is connected with that of his neighbor, and communication is established. By this arrangement, it is obvious that each subscriber can be put in direct communication with all the others, and the pronounced advantages of the plan will be obvious to all our readers. The *Journal of the Telegraph* comments with satisfaction on this new feature of the device, noticing among other things that the demand for the introduction of telephone exchanges, even in small places, is very urgent, and is constantly increasing as their advantages become known, and believes that they will eventually be found in every place of sufficient importance to require them.

**The Keely Motor** possesses at least one quality which its most pronounced enemy must yield to it, and that quality is an extraordinary vitality. After several years of quiescence, and when the public had almost forgotten that there was such a thing, the columns of one of the leading New York dailies contains the announcement that Mr. Keely has constructed an entirely new machine, which he terms "a vibratory engine," and which after much labor he has succeeded in "focalizing." The "cold vapor" of his former performances, and from which his manifestations of power are affirmed to be derived, is now denominated an "intermolecular etheric substance." The essential parts of the new machine are a steel disk on a shaft capable of revolving in a vertical plane, and having a large number of "highly vibratory steel pins projecting from it," the design of all of which, we are told, is to intensify the vibration of the intermolecular etheric substance, producing "a rotary or vertical circle of vibration."

These phrases may or may not have a meaning; they possess the eminent merit certainly of being utterly incomprehensible to the ordinary student of physics and mechanics, and it is impossible to understand the "why and wherefore" of such seemingly meaningless and mystifying publications. Mr. Keely's friends—and to our knowledge he has many, whose confidence in him is something akin to sublime—must surely know that the only effect of such articles on the educated portion of the public will be to confirm the almost universal opinion—whether just or unjust we can not stop to inquire—that the so-called "motor" is a cleverly-contrived piece of mechanical jugglery. There is only one thing that Mr. Keely can do—and that he must do before he will be patiently listened to by a long-suffering public—and that is, to make such a demonstration of the genuineness and practical value of his alleged discovery as will command belief. Until he is able to do this, let him be silent, and impose the exercise of the same virtue upon his friends.

**Sun-Spots and Commercial Crises.**—Prof. Stanley Jevons, whose advocacy of a relation of cause and effect between these phenomena lately called forth much criticism, is out with another paper in *Nature*, reviewing his critics, and reaffirming his faith in the hypothesis.

**Scientific News.**—In continuation of our notices of papers read at the late meeting of the National Academy, we append the following, from the subsequent proceedings of the meeting: "On a New Polariscope Method," etc. (C. F. Chandler); "On the Ignition of High-Tension Fuses (General H. L. Abbot); "Report on Dredgings in the Caribbean Sea" (Alex. Agassiz). The author affirms that most of the deep-sea fauna will be found within the limits of 2500 fathoms, and that it is unnecessary to extend deep-sea dredgings beyond that depth. The same author also discussed the question of the one-time existence of a continent connecting what are now the West India Islands with South and Central America, and occupying much of what is now the Caribbean Sea; and also advanced some peculiar theories respecting the Gulf Stream. "On a New Mineral Locality in Fairfield County, Conn." (J. G. Brush). The author gave an account of the discovery of a number of new phosphates at this locality, which have already been noticed in this department. "On the Great Silver Deposits recently Discovered in Colorado, Utah, and Nevada" (J. S. Newberry); "On the Recurrence of Solar Eclipses" (Simon Newcomb). The foregoing were among the most generally interesting of the papers presented.

**The Journal of the Franklin Institute** (May) has, among other articles of a strictly theoretical character, the following: "Tests of a Baldwin Locomotive" (John W. Hill, M.E.); "On the Driving Power of Leather Belts" (John H. Cooper), a very useful paper, being a translation of Paul Heilmann's "Observations" on the friction of belts upon the surface of pulleys, and upon the width to give to belts in special cases, presented originally before the Industrial Society of Mulhouse; "Steel for Ship Building" (John Haug), in which the author shows the great economy of steel ships as compared with those of iron; a notice of the "Gary Motor;" the usual quota of interesting items of scientific news; and the proceedings of the Institute.

**The American Chemical Journal** is the title of a new bi-monthly journal devoted to chemistry pure and applied, the initial number of which has just appeared. It is issued under the editorial management of Prof. Ira Remsen, a well-known American chemist, and is primarily devoted apparently to furnishing American chemists a medium of publication for their original investigations, a want that has not hitherto been met. The first number has among others the following papers: "On the Complex Organic Acids" (Wolcott Gibbs); "On Nitrogen Iodide" (J. W. Mallet); a paper on "Lockyer's Hypothesis Concerning the Compound Nature of the so-called Chemical Elements" (C. S. Hastings), besides reviews and excerpts. The *Journal* promises to be very useful.

**Kansas City Review of Science and Industry** (May) has the following articles worthy of notice: "French Expedition to Central America" (Capt. H. W. Howgate, U.S.A.); an interesting condensation from the official narrative of the hazardous expedition of MM. de Brazze and Ballay to explore the Ogowe, the principal river of the French-African possessions; "On the Origin and Formation of Coal" (Prof. E. L. Berthoud), with especial reference to those of the Rocky Mountains; "Recent Facts from Colorado" (John K. Hallowell), a graphic letter from the mining region about Rosita, Silver Cliff, and Leadville; the usual science letter from Paris, and notes of scientific progress from various sources. The *Review* enters upon its third volume.

**The Sydney Exhibition.**—From the official announcement of this Exhibition, just to hand, we notice that the system of classification which has been adopted is mainly framed on that used at the Centennial Exhibition at Philadelphia, the several departments being: (1) Mining, (2) Manufactures, (3) Education and Science, (4) Art, (5) Machinery, (6) Agriculture, (7) Horticulture. In the general features of arrangements and facilities for exhibition, the official programme shows these to be all that could be asked for. Exhibits are to be admitted free of duty, and special provision is made by the colonial government for the protection of inventions capable of being patented in New South Wales. The general reception of articles in the exhibition building will commence on July 1st, but applications for space must be made at least one month prior to the date of opening, which is fixed for the first week of September next.

### Chemistry, Physics, and Technology.

**Barff's Process for Preserving Iron.**—Prof. Barff, the inventor of the process of protecting iron surfaces from oxidation which bears his name, lately gave a lecture in London describing its details, and giving some of the results that had been attained by the new process since its first announcement, some two years ago. The general principle involved in the Barff process, that is, "the protection of a metal by means of a film of its own oxide," our readers are already familiar with; but, as the actual mode of procedure may not be so generally known, we give the following summary of the plan from the lecture above alluded to: To obtain a permanently adherent coating of oxide upon iron objects, Barff subjects them to the action of superheated steam at an elevated temperature, the resulting coating being a hard, obstinately adherent film of black oxide, which prevents the corrosion of the object far better than paint, lacquers, or other applications heretofore made to the surfaces of exposed iron-work.

The articles to be treated are first pickled in the usual way with dilute sulphuric acid; then, after washing with bran-water, they are placed in a muffle heated to about 500° to 600° Fahr., into which dry superheated steam at a temperature of about 1000° Fahr. is admitted, care being taken to exclude the entrance of air. Under these circumstances, the film of black oxide is rapidly formed on the sensitive iron surfaces. This coating is said to have very peculiar and valuable properties. The most prominent we quote: It is, as before remarked, obstinately adherent to the iron on which it has formed; its hardness is such that it is said to resist emery powder and the file; it is affirmed to be proof against dampness, the action of water (hot or cold); to resist the action of the weather far better than galvanized or painted iron; and iron thus protected, it is said, may be heated red-hot without injuring the skin. For these reasons, iron work (as for bridges and other architectural uses) is better protected against weather wear than by any other process. "Barffed" boiler and ship plates are affirmed to be superior to all others in resisting corrosion and the adherence of sediment, and "barffed" cooking utensils are said to be especially useful. For the full text of Prof. Barff's lecture, we refer our readers to the *Scientific American Supplement* (No. 174), and the same

anthority closes its comments thereon with the statement that "the process is applicable to almost every conceivable form of iron manufacture, and appears to be a scientific, important, and valuable contribution to the industrial wants of the world."

**Kerite,** an artificial caoutchouc invented by Mr. A. G. Day, is claimed by its inventor to possess eminent merits as a substitute for gutta-percha for telegraphic cables. His announcement claims that the kerite core is not injuriously affected by extremes of heat and cold experienced in any climate nor by length of exposure to the atmosphere. He affirms that it will endure long-continued heat below 200° Fahr., and for short intervals as high as 250° to 300° Fahr.; that it may be safely immersed in boiling water; that salt and fresh water improves its insulation; that it is not injured by the roots of plants which soon destroy gutta-percha; that acids act very slowly and only superficially upon it, while hot, concentrated alkalies do not affect it; and that mineral oils and illuminating gas, so far as is known, do not deteriorate its insulating qualities. It is further claimed, on the strength of samples of this core laid in the Caribbean Sea and on the Isthmus of Panama, that neither the teredo, so destructive to gutta-percha in the former, nor the white ant of the latter, has harmed it.

**Virginine** is the name applied by Professor Sonnenschein in the *Pharmac. Zeitung* to a semi-transparent, yellowish, fatty mass, showing when fused a bluish fluorescence, which substance he obtains from the residue left from the distillation of crude petroleum. It melts at 47° C., is partly soluble in ether, and is stable. It appears to us questionable if this can be called a new observation, as many similar compounds have been obtained from the petroleum residues.

**The Decomposition of Metallic Sulphides.**—MM. De Clermont and Frommel report in the *Bulletin of the Chemical Society of Paris* their observation that certain metallic sulphides, notably those of iron, nickel, cobalt, antimony, arsenic, tin, and silver, undergo decomposition when boiled for some time in water, the decomposition being attended with the liberation of sulphureted hydrogen and the formation of the corresponding oxide of the metal; other metallic sulphides, on the other hand, such as those of copper, zinc, mercury, cadmium, gold, platinum, molybdenum, are unaffected. From the abstract of this research, which we glean from the *Pharmacist* (Chicago), it does not appear whether this reaction is sufficiently rapid or perfect to admit of being utilized by the analyst, but in all probability the operation is too slow and imperfect for the purpose.

**The Process of Barff** for protecting iron surfaces from oxidation by treating the same to the action of superheated steam in close chambers, to which we have made several references in these columns, has a rival, it appears, in the procedure of Mr. Bower, who employs heated air. Concerning this, Prof. Barff having been reported as affirming, in a recent lecture before the Society of Arts of London, that it could not be successfully employed because of the impossibility of perfectly covering the metal, Mr. Bower comes to the defense of his invention with the declaration that the French government has adopted it for the coating of rifle-barrels, and affirms on his part that he is now ready to apply his mode of treatment, which is cheaper and simpler than that of Barff, to ordinary articles for general uses.

**Glass Type.**—From the Paris correspondence of the *Kansas City Review* we are informed that a French firm (Messrs. Montcarmont & Dumas) is engaged extensively in the manufacture of type from glass toughened by the De la Bastie process. The correspondent vouches for the fact that the glass types give impressions quite as clear and sharp as those obtained from the usual type-metal letters, that they can be cast in the same mold, and turn out as well. They can not be "battered" by blows of the mallet or by accident, are not injured by stereotyping, have remarkable wearing powers, and will permit the use of any colors in color printing—which is not the case with metal type.

**The New Explosive Compound** of Mr. J. E. Huetter, and which is said to be largely in use in Germany and England as a blasting agent for mining purposes, is composed of a mixture of gun-cotton and nitrate of baryta. The gun-cotton, previously dried in a centrifugal apparatus, is passed through a mill with the nitrate, and the powder thus obtained is pressed into cartridges covered with several layers of paraffined paper, to protect the contents from the effects of moisture.

**In his Report on Chemical Products** at the Paris Exhibition, Gustav Engel ventures the opinion that at no distant period the natural coloring matters employed in dyeing will be entirely displaced by artificial dyes. He bases his prediction upon the steady improvement in the manufacture and increase in the use of aniline colors, artificial madder, etc., and the synthetical production of indigotine, which has lately been accomplished.

**Imperishable Water-Colors.**—A Frenchman (M. Mery) is credited by our contemporary the *American Architect* with having discovered a process for making and applying imperishable water-colors. From the meager account given of the alleged discovery, it appears that M. Mery does not explain what he uses as the vehicle for his pigments, beyond stating that it is something which, while it will mix with water, does not dissolve in it. It is affirmed to render the colors as hard as cement or stone, and unalterable to a degree that warrants the word indestructible. It can be applied to wood, paper, glass, stone, canvas, or any surface suitable for ordinary oil or water painting, and can be made to dry speedily or otherwise. "It is suggested that M. Mery has rediscovered the long lost art of encaustic painting, which is supposed to have been applied and fixed by means of heat."

**The Gravivolumeter** is the name applied by M. Houzeau to a convenient apparatus for laboratory use, lately presented at one of the sessions of the French Academy. The gravivolumeter is designed to give drops of a liquid which shall always have exactly the same weight, the errors resulting from the personal equation, differences in the level of the liquid, having been eliminated. The apparatus is figured in the *Comptes Rendus*, April 7th.

**A Process for Utilizing Rubber Waste**, lately patented by Thomas Aspden, consists in cutting the material into pieces of suitable size, moistening these with linseed-oil, heating the oil-covered pieces until they become plastic, and then, after allowing the mass to cool, boiling it in linseed-oil in quantity sufficient to reduce it to the state of a fluid of the required strength or density.

## Metallurgy and Geology.

**The Geological Survey of Ohio,** under the direction of Professor Newberry, has just issued a large volume, constituting Part I. of Volume III. (Geology), of 958 pp., uniform with the previous publications of the survey. This volume contains a detailed geological description of 35 counties of the State, with a prefatory note and a general review of the geological structure of the State by Professor Newberry, and a supplemental report of a new and thorough resurvey of the Hocking Valley coal-field.——There have also been issued from the Geological Survey of Kentucky, Reports on the Timber Trees of the Tidewater Region; on the Timber Trees of the Purchase District; on the Cumberland River Iron Ores (Limonite); and on Coal Washing for the Separation of Coal from its Impurities, all by various members of the geological corps.——Prof. Frederick Prime, of the Second Geological Survey of Pennsylvania, has compiled a very full catalogue (comprising 50 pp.) of official reports upon geological surveys of the United States and territories and of British North America, which was greatly needed and which will be of much assistance to students and investigators in the work of making references. ——Prof. George H. Cook's Annual Report (1878) of the New Jersey Survey, lately issued, contains chapters on the Glacial and Modified Drift; Preliminary Description and Classification of the Soils of New Jersey; Miscellaneous Clay Deposits; Glass Sand; United States Coast Survey Triangulation in the State; Progress of the Drainage Work on the Great Meadows of the Pequest; Water Supply; Statistics; and a map showing the surface geology of the State.

**A Successful Trial** of the lately-described plan of utilizing sulphurets as fuel is reported in the London *Engineer* as having been made at the Atlas Works, Sheffield. Four cupolas were used in the trial. In the first was placed a charge of Spanish pyrites and limestone, and the other three were used as condensers. The whole charge, by means of a blast, was melted without the use of extraneous fuel; much of the sulphur was collected in a free state, and the copper and iron concentrated into a regulus of very good quality. The result of the trial is reported as highly satisfactory, and it is thought, says our contemporary, that "if the apparent practical success is permanent, the process will revolutionize the system of copper smelting."

**An Interesting Observation** concerning the supposed growth of gold nuggets was reported by Mr. G. Atwood, in a paper on "A Gold Nugget from South America," lately read before the London Chemical Society. He stated that the nugget in question was found in alluvial soil in Venezuela, where numerous gold-bearing quartz veins are found in the neighboring hills. About half of the nuggets found in the soil are covered with a dark-brown substance resembling a silicate of iron, on dissolving which much fine gold separates, and the nugget is partly covered with dull, fine gold. The author concluded from his observation that gold nuggets gradually increase by accretion.

**Of Nordenskjold's Expedition** nothing has been heard since his parting from his companion vessel at the mouth of the Lena, to make the passage of Behring's Strait, now over seven and a half months ago, and fears for his safety and that of his companions are now openly expressed. A Swedish relief expedition is about to set out at once to the rescue of the party, and James Gordon Bennett's steamer, the Jeannette, which is shortly to set out on her polar exploring trip from the port of San Francisco, will make an effort to discover the whereabouts of the Nordenskjöld party, and afford them relief.

**An Alloy** of extraordinary ductility and malleability, made by Matthey, of London, has, according to Phillips, the following constitution:

| | Per cent. |
|---|---|
| Platinum | 80·660 |
| Iridium | 19·079 |
| Rhodium | 0·122 |
| Iron | 0·098 |
| Ruthenium | 0·046 |
| | 100·005 |

## Engineering, Mechanics, etc.

**Important to Inventors of Life-Saving Appliances.**—It has just been announced that, by the authority of the Secretary of the Treasury, a board or commission has been appointed consisting of Capt. Forbes (Mass. Humane Society), Capt. Moore and Lieut. Sparrow (U. S. Revenue Marine service), and Mr. B. C. Sparrow and Capt. Patterson (of the Life-Saving service), to examine "all plans, devices, and inventions for the improvement of apparatus for use at life-saving stations, which may appear meritorious and available, and to examine and test as far as practicable all such as may be submitted by the general superintendent, and to make detailed reports of the results of the investigations and tests for his information." These investigations, it is explained, will cover the examination of all forms of appliances designed for the life-saving stations, except wreck ordnance and its immediate appurtenances, which will be referred to a special board of experts in gunnery, and will also exclude devices intended to be carried on shipboard. Parties wishing to present the claims of their inventions before this board should address themselves, for instructions, to S. I. Kimball, Supt. of the Life-Saving Service, Washington, D. C.

**The Use of Iron Cars,** which is now being more or less debated by railway engineers, is the subject of an interesting communication in the *Railroad Gazette*, where the statement is made by a well-known firm that some 500 iron box-cars, built some 20 years ago by the New York Central & Hudson River Railroad Company, are still, after 20 years of use, "to be found on the main line and its connections, in apparently as good condition as when new."

**The Model of an Iron Tie,** at present being experimentally tested by one of the Eastern railroads, was exhibited and described at a recent meeting of the Engineers' Club of Philadelphia. From the report of the proceedings, it appears that this device dispenses with the use of spikes, bolts, nuts, or fish-plates, and with the drilling and punching of rails, and avoids the consequent dangers of weakening or fracture from such causes. The mode of attachment is by means of a recess with which

each tie is provided, along the bottom of which recesses wedge-shaped transverse pieces are cast. At the sides of the recesses are two creosoted blocks of wood, which form a cushion and a fulcrum for two clamps, which grasp the flange and web of the rail above, bearing upon opposite faces of the wedge below. By this device, the weight of the tram increases the grip of the clamps. The first cost of this tie is greater than that of the wooden tie, but this is declared to be more than offset by its much greater durability.

**An Improvement in Locomotive Chimneys**—which, it is claimed by its inventors (Messrs. John Baird, Chief Engineer, and Allan Sterling, Master Mechanic of the New York Elevated Railroad), will do away with the noise incident to the escape of smoke and steam—consists substantially of an expansive chimney and an annular nozzle placed in the chimney, which is declared to effect a regular and noiseless escape of the steam and smoke, instead of a roaring and intermittent one, as at present. The steam from the cylinders is passed into a chamber of ten times the capacity of the cylinders, which, allowing it to expand, and thus to greatly reduce its pressure, greatly reduces the noise of puffing.

**The Draining of Lake Fucino,** the existence of which has for centuries been one of the prime causes of the unwholesomeness of the Roman Campagna, is being extensively commented upon as one of the most interesting of modern engineering works. After many fruitless efforts, commencing with the Romans, the work has at length been successfully performed by an enterprising Italian, Prince Torlonia. The immediate effect has been the reclaiming of a vast tract of land for agricultural purposes, and the decided improvement of the sanitary condition of the surrounding region.

**Wrought-Iron Tube Cars.**—As an interesting novelty in car-construction, we record the fact that the National Tube Works Company has recently completed for a Southern railroad, six Tiffany Refrigerator cars, the frame-work of which consists of wrought-iron tubes and steel rods. This system of construction is said to insure greater lightness, carrying capacity, and durability.

**The Record of New Railroad Construction** reported by the *Railroad Gazette* of May 9th figures up to 408 miles, as compared with 307 miles reported for the same period of 1878, and 341 for 1877.

**Engineering Items.**—The National Congress is asked to ascertain the correctness of the statement that there are but 150 miles between the navigable waters of the Missouri and the Columbia river, and for this purpose a survey of the passes lying between their head-waters is recommended. ——The statement that the lower (peninsular) portion of the interior of Florida is a basin below the sea level, and only protected from inundation by a slightly elevated boundary sand ridge along the coast, is affirmed to have been shown to be untrue by the government survey under Col. Meigs. He is said to have established the fact that the interior of the lower peninsula is sufficiently elevated for the successful application of works for the drainage and reclamation of the lands. The execution of this work would, it is further affirmed, reclaim a large territory suitable for the cultivation of the sugar-cane.——General Newton, U. S. Engineer Corps, who was authorized by the government to make a preliminary survey to determine the feasibility of constructing a ship-canal between New York and Newark bays, is at present engaged on the work. The proposed canal would be about a mile in length, and would decrease the distance between this city and Newark by about 12 miles. (For the facts contained in the foregoing we are indebted to *Engineering News.*)

---

THE Reading Railroad, it is announced, has paid off all its employés to March 31st. The miners are now being paid for April, and preparations are making for paying the railway hands for April. The company now has less than $200,000 of the $1,575,000 wages certificates issued remaining outstanding, all the others having been redeemed. The wages payments the company is now making are in cash.

MR. E. MUELLER, Receiver of the Union Consolidated Mining Company, of Tennessee, has finally smelted and converted into copper the ores that were on hand at the beginning of his receivership; and it is currently reported that this was done at a profit, even at the low price of copper. The product has been over 1,250,000 lbs., which demonstrates that under an economical management these mines can be successfully worked.

THE ELECTRIC LIGHT.—Dr. John Hopkinson, F.R.S., has estimated that only 44 per cent of the energy transmitted to electric machines by the strap is utilized in the arc, where carbon points are used. Mr. Preece, the English electrician, commenting on the fact, refers to a reverse current being set up, the cause of which is unknown, and states that the best of the electric machines do not give more than 90 per cent of the engine power. He has no doubt that, when the inductive effect of magnetism of iron is studied out, various disturbances will be eliminated. Dr. Hopkinson is about to enter on a course of quantitative experiments with electric light. He has adopted what Mr. Preece terms "a pretty correct method" of measuring currents.

## REPORTS OF AMERICAN MINES UNDER ENGLISH MANAGEMENT.

LONDON & CALIFORNIA.—The report of the directors, for the six months ending December 31st, shows that the yield of the original Amador mine in that time was about the average, profit slightly exceeding expenditure. It produced 2194 tons of ore, and the mill crushed 2236 tons, which yielded, in free gold, $35,800.64, an average per ton of $16.10. The average working expenses were $12.20. The sum of $7065 had been spent in sinking the east shaft 166 feet deeper, making total depth 732 feet. A cross-cut had been started with the view of seeking the westerly vein, and when this was sufficiently out of the way, the deepening of the shaft would be continued. There appeared to be a vein standing up and down at their boundary at Bunker Hill, worth about $12 per ton. The purchase has been made by the company of two new properties—the Maryland and the Seaton—for $27,000. The mines adjoin each other, and will be developed as one property, the outlay required to bring them into working order being estimated at from $30,000 to $50,000, which sum will be spent out of capital in hand amounting to $110,000.

SIERRA BUTTES.—The net profit for the half-year ending December, 1878, was $39,055, which, with $46,835 brought down from the previous account, made the total sum standing to credit of profit and loss $85,890, out of which a dividend has been declared of 1s. 6d. per share, exceeding by $6875 the half-year's earnings. The small amount of earnings is attributed, in part, to the cost of permanent works in connection with mills and water supply. The mine produced 28,547 tons of ore in the half-year; the total working expenses amounted to $3.74 per ton. The sixth level has been extended 197 feet, and an encouraging amount of profitable ore has been found by additional cross-cuts. The value of the ore now in sight is estimated at $25 per ton. The amount spent in prospecting was $20,830; outlay on improvements, $10,632. The mills can now be run with less water than formerly. The directors have also the accounts of the Plumas-Eureka mine. The net profit for the half-year was $104,160, making with $62,472 a total of $166,632, out of which a dividend of 75 cents per share has been declared. The mine produced in the half-year 23,186 tons, at a mining cost of $3.49 per ton; average working cost, $4.27 per ton. The yield of the ore in free gold was $9.54. The Mohawk tunnel has been extended in the six months 393 feet, and a promising cross-cut made, which, it is believed, will lead to a large and profitable vein in a deeper level.

## GENERAL MINING NEWS.

### ARIZONA.

#### THE MOHAVE COUNTY MINES.

The *Enterprise* of the 3d inst. says of the McCrackin and Signal mines:

"Of the busy town of 1000 people, perhaps twenty-five are left, until hardly a sound is heard. So much for the management of men who sit in palace offices, luxuriantly furnished with other people's money, who think they know how to manage a valuable mining property, but have, as always, failed. Every body here—those who know, and those who ought to know—believe that both these mines are as good to-day as they were years ago, and the ore just as rich at least. The appearance of the mines and the assays of the ores prove both these assertions to be correct. The reasons given for the failures are these: First—Gross mismanagement. Second—No management. Third—A 'a freeze-out' game. Fourth—A determination on the part of San Francisco stock gamblers to give Arizona as many 'black eyes' as possible.

"The Arnold Mining Company, of Cedar Valley, has four arastras turning out $3000 per month, and will soon erect a mill upon the Arnold mine. Fire-brick clay and sand have been discovered within two hundred feet of the mine, and a kiln of very fine brick (6000) burned as a test. The company is now erecting a reverberatory furnace for the purpose of roasting the ores, and is pushing the work on both tunnels and in the main shaft, and will begin to sink a new working shaft next week.

"The Silver Queen has 100 feet of water in its main shaft. The Arnold has one shaft 45 feet deep full of water, and flows over the top. The Magendie mine has 50 feet of water in one of its shafts. So it would seem that Cedar Valley will be well supplied with water, notwithstanding the continued dry season."

A correspondent of the *Miner* says:

"Wickenburg and the new town of Seymour, situate about twelve miles south-east, are quite lively. The Central Arizona Mining Company's new forty-stamp mill, adjoining Seymour, is being rapidly built. This company owns one thousand feet of the Vulture property. The owners of the remaining interests of the Vulture are actively pushing the survey for the pipes and other work necessary to take the water from the Hassayampa to the mine, where an eighty-stamp mill is to be erected at an early day. To conduct the water will cost in the neigborhood of sixty thousand dollars; but this outlay and the building of an eighty-stamp mill, although amounting to a round figure, will be fully justified in the return which the company will receive when the works are in operation. The Vulture is an immense gold-bearing lode over one hundred feet thick, and the ore will all pay to mill.

"It is confidently believed that the mines of Bradshaw will yield, between now and the first of the coming new year, 1880, one million dollars in bullion.

### CALIFORNIA.

#### THE BODIE DISTRICT.

From the *Standard* of the 3d inst. we condense as follows:

"The Noonday appears this week for the first time in the rank of bullion shippers, $12,981.46 being the result of a few days' run at the Syndicate mill. The presence of manganese in considerable quantities, and certain other peculiaritics of the ore, render special treatment necessary in its reduction, in order to bring out its full value. The Noonday Company will in all probability erect a mill at once, with special reference to these facts, in the vicinity of the mine. The south end, we feel confident, will revive from its present rather depressed condition. The Booker is about to put on very heavy machinery, which will enable the company to prospect thoroughly below the water-level. The Richer is doing good work. The Sigourney, at the extreme south end, which was a favorite claim last summer, but on which no work was done during the winter, is being developed by an incline shaft, and is showing a fine 3-foot ledge of silver-bearing ore. The most interesting developments of the week have been made in Tioga and Jupiter. The Bulwer and Standard are turning out a constant stream of bullion. Our neighboring districts—Lake, Prescott, Laurel Hill, Indian, and Keith—are attracting no little attention, and Lake is creating a genuine furor. The Mammoth has now cut rich ore in its cross-cuts from the tunnel, which is being taken out in sacks."

From the *Chronicle* we take the following:

"The Standard Company is rapidly pushing the cross-cuts on the 700 level, and, in view of future wants or contingencies, it has set about the work of putting in place the large pumping machinery which has been lying around loose on the hill at the main hoisting works. It will require two or three months to cut out the foundation for the engine and get the entire works in good running order, but it is significant of the business-like programme of the company—its confidence in the future of the great property—that such a costly establishment should be decided upon with regard to completion. What with the developments already made in the claim in a hundred places, and ore reserves in sight, these later and larger operations on the tapis mean a work of years, and all those interested in the district will feel encouraged to renewed energy and inspired to new hope and confidence. The management of the Dudley, Jupiter, and Syndicate mines have concluded to erect pumping machinery on the Dudley sufficient to sink and prospect their claim thoroughly to a depth of 600 feet; steam hoisting works on the Jupiter of a sinking capacity of 1000 feet, and the insertion of air-compressor power at the Syndicate, for the purpose of pushing the main tunnel cross-cut work of exploration in that large claim. The Standard will keep the Syndicate Mill running; the Bulwer, the Bodie, and the Noonday, the Miners' Mill, so that the regular shipment of bullion will go on. It is not unlikely that a new mill will be erected during the present season by the Bulwer Company, in view of the good prospects of the Tioga Company, which may employ the Syndicate at an early day and indefinitely. The Bulwer tunnel is rapidly approaching completion, and a mill may yet be built at the same for the joint interest of both the Standard and Bulwer mines."

## COLORADO.

### SILVER CLIFF.

The St. Louis Mining and Smelting Company have commenced the erection at Silver Cliff of a smelter of ten tons capacity.

The Ranger, in Dead Mule Gulch, is reported to have two feet of ore, assaying 173 ozs. of silver at a depth of 10 feet.

The Snybar mine reports a mill-run of 47 ozs. of silver and 7 ozs. of gold per ton. The Silver Cliff Smelting Company's thirty-ton smelter is reported to be on the way.

### LEADVILLE.

The Dunkin mine reports a run of 912 ozs. of silver per ton for first-class ore, and 248 ozs. for second-class. Assays from the Judge Hendrie mine are reported at 461 ozs. and 171 ozs. A little over a ton of ore from the Pendery mine sold for $500. The Highland Mary mine, adjoining the Double Decker, in Stray Horse Gulch, has struck 14 feet of soft carbonates at a depth of 180 feet. Assays give from 23 to 100 ozs. silver per ton.

It is rumored that Governor Routt and his associates have sold a one-third interest in the Idaho mine at Leadville, and machinery has been shipped for the entire working of the property.

### CLEAR CREEK COUNTY.

On the Terrible property, the Silver Ore shaft is down 168 feet and the Terrible 128 feet below the level of the Union Tunnel. The Silver Ore, which is about 700 feet below the surface of the mountain, carries some ore.

The Georgetown *Miner* says :

"That portion of the East Terrible leased by Dr. Lemen continues to turn out ore about as usual, which, however, is considerably harder and more solid than that taken out some months ago, consisting mainly of galena and zinc, and carrying tetrahedrite and iron pyrites. Eighty feet below the tunnel level, a drift is progressing easterly on about three inches of ore. West of the shaft, at a depth of fifty feet, the vein is opened by a drift from fifty to sixty feet long. The breast carries from two to six inches of ore mixed with quartz, and the back of the stope on the same drift shows two to three inches of good grade ore. The general grade of the mineral is from 400 to 500 ounces for first-class and from 125 to 150 ounces for second class. Ten men are employed in this ground."

The Dunkirk carries from 3 to 6 inches of fine-grained, bright though not hard galena, which in a late run gave silver at the rate of 345 ozs. per ton. A previous run gave 652 ozs. The Fletcher Gold and Silver Mining Co. is about to resume operations on the Matilda Fletcher lode. The ore from this lode is reported to have averaged from 250 to 700 ozs. of silver per ton when last worked. A question of title has been the cause of idleness at this mine. This, however, has been amicably settled.

## DAKOTA.

### THE BLACK HILLS.

Regarding the operations of the Cheyenne Mining Company, the Superintendent, Mr. Gideon Frisbee, writes from Deadwood, under date of May 5th, as follows :

"The work now in progress on the Cheyenne mine is in the two drifts. The storm on the 21st ult. obliged us to stop the mill, making the roads so bad that we could not move the ore, and also stopped work in the shaft drift, so much surface-water running into the shaft as to prevent working. We resumed work on the shaft drift on the 3d, with two shifts working in ore. Three shifts of men have been kept at work in the upper drift (which goes in on a level with the adit), and it is now in 98 feet (including open cut, 115 feet). At 90 feet a spur of porphyry about six feet thick was passed, and the face of drift is now changing to quartz. We will prove the extent of the latter before cross-cutting. The ore passed through before reaching the porphyry is of the same character as that in the shaft.

"Work was begun on the Hoodlebug on the 28th ult., and we are now ready to send ore to the mill from it. We have two shifts of men at work, and will start the mill at once on the ore.

"We have begun to sink a double compartment shaft 9 × 13 ft., and propose to drive a double track working tunnel from a point in Poorman Gulch about 200 ft. lower than the adit from which the shaft starts, which will give an easy grade for delivery of ore, in case the new mill should be located on the Badger Mill site, or below it. Our operations on the Hoodlebug are disclosing ore that carries free gold in such quantities that it is easy to find numbers of free-gold specimens, and the shaft starts in a stratum over 12 ft. wide that is considerably better than the average."

The *Herald* of the 4th inst. says of the Bald Mountain mines :

"This portion of the Black Hills gold-belt is situated two miles west of Central City, at the head of Deadwood Gulch. During the past sixty days, mining property on Bald Mountain, to the amount of over $500,000, has changed hands.

"The Trojan mine was bonded this week for $200,000, and there is enough ore in sight to more than pay the purchase-money.

"The Huxley owners have refused $150,000 for their mine within the past few days.

"Northwest of the Trojan is the Des Moines mine, the vein of ore in which is about thirty feet wide, and is visible the whole length of the claim, a distance of fifteen hundred feet.

"Free gold is easily found in all these mines, and the ore can be extracted from them for fifty cents per ton, it being very soft and easy to mill.

"From the Hoodoo and the May mines, at Strawbery Gulch, fine specimens are daily being taken out, bearing free gold in large quantities.

"One word of advice to the Eastern and Western capitalists, now rushing in from all quarters ; our mines were located and are owned by old, experienced miners, who know their value and are content to bide their time. If they have not the means to buy a good mine, they had better stay at home."

The *Times* of May 3d says : "The new Homestake Mill is 100 by 90 feet. The sides are 32 feet high, and the height from the floor to the cone of the roof is 78 feet. The entire structure is of the best Black Hills timber, 1,000,000 feet being used in its construction. The celebrated Corliss engine of 300 horse-power, purchased at Providence, R. I., is now being placed. It weighs 80,000 pounds, having two fly-wheels 56 feet in circumference. The mill will cost $200,000, and will have, when completed, 120 stamps, with a capacity of crushing 525 tons of ore per day."

### BLACK HILLS MINING TITLES.

YANKTON, D. T., May 13.—In the Supreme Court last night, a decision was rendered affecting the validity of many Black Hills mining titles. It was on an appeal in the case of Ahly *vs.* Garrison, in which the court below ruled that the Indian title to the Black Hills country was invalid, and that legal title to the property was vested in the claimants who first took possession, even if it occurred prior to the relinquishment of the country by the Indian treaty. The Supreme Court reverses this ruling, and holds that no title could be acquired until the country was ceded to the government by its Indian owners. Opinion by Chief-Justice Shannon, his associates concurring.

## IDAHO.

### THE SOUTH MOUNTAIN MINES.

From a letter published in the Silver City *Avalanche* of May 3d, regarding these mines, we condense as follows :

"The Philadelphia tunnel is run in the Black Diamond mine 300 feet. Another ledge, called the Golden Monarch, runs in an obtuse angle toward the Black Diamond. The tunnel aims to strike the point of intersection, where a large ore-chamber will be found. There is a large quantity of good ore, carbonates, and galena in these mines ; 275 feet from the entrance of the tunnel a body of galena was found, and drifted on a short distance until the ledge completely fills the drift. The tunnel was driven ahead again, and is now in good ore some 30 feet from this pocket or chimney There are a good many stringers of ore in the tunnel, diverging toward the Monarch, and indications are getting more favorable than ever before. The rock encountered in the tunnel is very hard, being a combination of iron and spar, as in the Mona tunnel, but breaks better. A species of flinty quartz runs in small strata through the tunnel. It is very hard drilling in this rock, often taking hours to drill an inch or two."

The same paper observes : "Our South Mountain correspondent directs attention to the necessity for the erection of a small furnace in that camp for smelting ores. It is stated that it would not cost $3000 to get the machinery, erect such a work, and put it in running order. There can be no doubt whatever that such an enterprise would pay handsomely, and it would seem that such a comparatively small sum ought to be hunted up somewhere, and put to just such a use as this. South Mountain is well stocked with mines that yield ore in abundance worth from $40 to $100 to the ton, and such a furnace could be amply supplied with rock for years to come."

Regarding the Bonaparte mine, which is situated 100 miles northeast of Boise City, south of the Rocky Bar mining district in Alturas County, we note that it comprises 5100 feet in length by 600 feet in width on the vein, which crops out at various points, and is readily traced. The first shaft was sunk at a point where the vein was but six inches in width. At the surface much free gold was found. The shaft was sunk to a depth of fifty feet, and the vein was found to be two and a half feet in width. A tunnel was also run at this point a distance of seventy-five feet to connect with the bottom of the shaft, and this constitutes the first level. Four levels have been reached and various tunnels run, the vein in one division of the 250 level showing a width of eight feet of rich ore, running from $500 to $2000 per ton in silver and gold. It averages $300 per ton. The company will soon begin reducing their ore on a large scale, a twenty-stamp mill having been erected, run by water and steam.

## MONTANA.

### THE PENOBSCOT MINE.

From the Butte *Miner* of May 8th we condense the following regarding this property :

"Descending to the 60-foot level, or first below the surface, we enter the east drift and follow it 126 feet to the breast. When Capt. Ryan took charge, the breast was in barren ground or a 'horse,' and many supposed the mine had played out, but ten feet further and the vein was as good as ever. Now the drift is about 60 feet past the cap and carries a body of quartz at least 8 feet wide its entire length. This level is continued west of the shaft and in a few days will connect with a level now being run east from the bottom of the Blacksmith Shop shaft. This will ventilate the mine thoroughly. A short distance west of the main shaft on this level, the ore widens out to fully 15 feet, with not a particle of waste ; and 40 feet below at the 100-foot level the streak is 18 feet wide, and as free from waste rock as the level above. Numerous samples of the entire crevice in these two drifts give returns of 50 per ton. Forty feet further down the ladder, and we are on the 100-foot level. We follow it east for 190 feet, and west for 260 feet, all the way through solid ore varying from 20 to 18 feet in width A winze sunk on each side of the shaft, and about 100 feet therefrom, connects with the level above. * * * The shaft at this point is 35 feet in length by 10 feet in width. This will be its size hereafter, and quite likely when strong iron cages are run up and down it will be made the size from top to bottom. In the part of the mine we have described, scarcely any work has been done except sinking the shaft, running levels, and sinking winzes. No stoping of any kind has been done ; in fact, all the ore that has kept the 20-stamp mill and three arastra-beds running has been taken from these openings. Yet there is ore enough in sight at this stage of development to keep a 40-stamp mill constantly at work for two years and pay the purchase price of the mine many times over. * * * Coming to the surface and going west 260 feet, we come to the Blacksmith Shop shaft, 70 feet deep, from the bottom of which a level is being run to connect with a level in the main shaft for ventilation, as we described above; 206 feet further on, and 466 feet west of Bonanza shaft, a cross-cut tunnel taps the vein and is driven west along the vein in splendid ore, 90 feet ; 140 feet west of where the cross-cut taps the vein is the Snow Drift shaft, sometimes called Discovery, as it is the extreme eastern end of the Snow Drift and western end of the Penobscot. From this shaft, west, the ground is nearly level for 400 feet, but descends quite steep easterly to a point where the cross-cut intersects the vein.

"The object of the cross-cut tunnel is to bring all the ore lying 100 feet below the surface at the east end of the Snow Drift and west end of the Penobscot to the level of the tramway. The tramway connecting the mine with the stamp-mill, when completed, will be 3500 feet long. The great part of it was built last fall. As soon as the snow disappears, a force will be employed to finish the work. The wire-cable track iron and timber is all on the ground. When completed, the cars will be loaded at either of the openings on the lode, run down the 3500-foot incline, and dumped automatically in an ore-house with a capacity of 1000 tons. From the ore-house the rock is trammed a distance of 30 feet, and this dumped in front of the rock-breaker in the mill.

"The plant of the mill is of the most complete character."

## NEVADA.

### THE COMSTOCK.

The Gold Hill *News* of the 8th inst. says :

"The late improvement in the Ophir incline is the most important development which has been brought to light within the past week, and that is of such a character as to compel attention from all those who are interested in the shares of the mine ; indeed, it is the finest prospect encountered in the Ophir for years.

"The bottom of this incline has penetrated a body of ore about 14 feet. This ore-body has every indication of being a formation never before encountered in the mine. The characteristics of the body itself, as well as its approaches, differ essentially from all others of the mine.

"The approaches were first encountered in the incline between the 2100 and 2200 levels. Since that time the stringers of quartz and the general kindliness of the vein matter have increased. Last Tuesday, the incline cut through a clay wall from four inches to one foot in thickness, and entered the present ore-body. The surrounding porphyry abounds in pyrites of iron, and other friendly indications.

"When first encountered, the indications were that the ore-body had a dip to the west, similar to the stringers of quartz found before reaching it. After penetrating it a few feet, however, the slips of clay in the ore-body all had a regular pitch to the east. The ore-body has increased in richness as depth has been gained. Assays now run from $12 to $90, of which over one half is gold.

"Sierra Nevada makes haste slowly in sinking her incline. A sill floor has been extended from the north cross-cut, 2200 level, under the incline to the south cross cut. The vein on that level is being stoped out, and its breadth determined. The ore is very rich, and the Mariposa mill will soon commence its reduction. When the new pumps are in place in the east shaft, and the incline machinery transferred to the 2200 level, work below that level will be much more rapidly advanced.

"The only further point of importance within the week has been in the reaching of the 1750 by the Alta-Benton winze, and the opening out of the station there. That the Alta has ore is generally believed. None has ever been extracted, and the proposed cross-cuts on the three levels where the vein has been

bared are looked forward to with much interest. The finding of a new formation carrying water, near the 1750 level, is also worthy of a passing remark.

"The advance recently taken toward working through a combination shaft by the Crown Point, Belcher, Seg. Belcher, Overman, and Caledonia is significant. It means economy and practicability. The combination is an important one. That to operate before long through the Yellow Jacket new shaft is also of interest. The workings of the Comstock further north will soon be made through the Chollar-Norcross-Savage shaft, the Osbiston shaft, the C. & C. shaft, and the North Cons. Virginia shaft. If Sierra Nevada does not before long operate through this latter shaft also, that mine must join the general movement eastward and sink a new shaft for the working of its long stretch of ground. A drift is about being started on the 1600 level of the Hale & Norcross, to connect it with the lateral drift of the Sutro Tunnel running out to the Julia mine. This drift will be over 300 feet in length, and will be pushed ahead at lightning speed—will, in short, be made a second 'lightning drift.' It is intended for use in case there shall at any time be more water sent to the Requa shaft than can be handled at that point."

THE SUTRO TUNNEL.

The Sutro *Independent* says: "An average of 150 holes per shift is being blasted in the tunnel, and 3750 feet of the sub-drain have been completed. The total length excavated to May 8th was 6450 feet, so that by June 15th the excavation could be completed. The drain will contain two boxes, each 18 × 24 inches in the clear. The material will be of 3-inch Sierra Nevada pine. This box, four miles long, if sawed into inch boards twelve inches wide, placed end to end, would reach from Virginia City to Sacramento, Cal. It is anticipated that the drain will be ready to receive the water by July 1st.

The Gold Hill *News* says: "The connection has been made between the Sutro Tunnel and the winze of the Savage between the 1600 and 1700 levels, and every thing is now in readiness to raise *débris* through that mine should Mr. Sutro see fit further on to accede to the terms imposed therefor. This is only a provisional remedy to be used in case Mr. Sutro finds himself unable to perfect the sub-drain according to contract. If possible, all the *débris* will be run out by the cars; but if time presses, more men will be put on and the last 4000 feet, as yet untouched, be completed from the Comstock end."

With reference to the above we note that Mr. Sutro, before the compromise, endeavored by a secret drift to connect the tunnel with the winze leading from the 1600 to the 1700 levels of the Savage in order to throw back into that mine any water it might let into the tunnel. Work on this drift has now been resumed with consent of the Savage by Mr. Sutro, and completed, in order that, if necessary to finish the tunnel on time, the *débris* of the last 4000 feet of the sub-drain can be run out to this winze and raised through the Savage. It is stated that the Savage, in consideration of the completion of this connection, had agreed to raise the *débris* for 80 cents per ton and that Mr. Sutro had consented to pay that sum.

Mr. Sutro has raised the wages of the carpenters, etc., employed on the tunnel.

THE PARADISE MINES.

The *Silver State* says:

"Work will soon be resumed by the Mount Rose Company. The Big Prize Company has fifteen miners at work. The mine looks well, and is producing rich ore regularly. The Bullion Company is at work on its ledge, which is now ten feet wide. The ore assays from $50 to $500 to the ton, and a few miners can keep a ten-stamp mill at work steadily. The Sedan Mill is now running on ore from this mine. Every mine in Mount Rose District, on which work is being carried on, looks well, and there are several good claims on which no work is being done at present. Taken all together, the prospects of the district never looked better."

## NEW MEXICO.

THE SANDIA MOUNTAIN MINES.

F. M. F. Cazin, M.E., writing to the Bernalillo (N. M.) *Mirror*, under date of the 3d inst., says of these mines: "Within an hour's drive from the town of Bernalillo we reach the foot-hills of the Sandia Mountains. I do not speak of the mesas or highland stretching forward into the valley of the Rio Grande to close vicinity of the water and town, but of the hills formed by the disturbance in the stratified rock, invariably facing with the abrupt broken side to the river and forming a gentle slope on the east side, such slope being conform with the dip of the strata. Where the abrupt precipices are, there a fault or fissuring of the giant below has taken place and true fissure veins have been formed. Such is the nature of one system of veins, in which a north and south strike is a general characteristic quality. Besides the lodes so formed, some of which near the surface have one wall of granite (east) and the other of lime-rock (west), there occur also true contact lodes, being on the contact between an eruptive rock and the country rock.

"The claims called 'Aztec' nearest to the river are of the former nature; those called 'Montezuma,' being on the north slope are of the latter nature. All the lodes so discovered have large bodies, varying, as far as developed at present, between five and twenty-five feet in width. In the Montezuma claims, five in number, two lodes crop out, one on each side of a trachitic dike, the one west carrying as base metal predominantly lead and the other predominantly copper, but both assaying silver and gold in paying quantity irrespective of the base metals. However much the total assay may vary, the portion in silver and gold by value remains nearly constant and nearly equal, the average total being $80 per ton from sound uncorroded ore.

"The value can be concentrated mechanically to from $320 to $800 per ton, and at least the 'Montezuma' shows ore-bodies sufficiently exposed to produce at present a regular supply of ten to fifteen tons per day, by small preliminary outlay.

"Stone, coal, and water are at hand near these mines, and the general climate circumstances are in these parts as favorable as anywhere. Common labor is worth seven and one half cents per hour.

"At a future time I will report as to title in the mines; but it may be easily perceived that those there busy at present go to work with an understanding of what they are about, as is proved by the way in which the mining district has been organized.

"There are no superfluous provisions, none to entangle matters further than they are by existing law; but the one object has been kept in view, namely, to better secure title in mining property, to resist to the probability of 'blackmailing.'"

The Las Vegas *Gazette* says of the Los Cerrillos mines:

"Los Cerillos is a group of conical peaks in a mountainous tract lying 21 miles south of Santa Fé. It is well authenticated that in these mountains the turquois, or precious gems which the Indians prized so highly when the Spaniards first entered New Mexico, came, and which were found in the sandstone and granular porphyry of Los Cerrillos. Immense cavities were worked out there for these gems by the aborigines, long before the conquest and settlement of the country. The greatest of these cavities is two hundred feet deep and over three hundred feet in diameter. Trees and shrubs are found at the bottom, gray with age and indicating the growth of centuries. When Cabeza de Baca passed through this country three hundred and forty-five years ago, in 1534, he relates in his narrative that the Indians gave him turquois which they had obtained from this identical group of peaks. They are thus proven to be old mines of precious mineral, but the Indians knew nothing of carbonates, and now a people of greater intelligence has commenced to develop their true wealth."

A correspondent writing to the New York *Times* from Cimarron, under date of April 29th, says of the mines in that region:

"On Ute Creek, eight miles up the cañon, is the old Aztec mine, opened in Maxwell's time, and from which Maxwell is said to have taken $1,000,000 in gold. The ore is described as of wonderful richness, being of the character known as free gold, and readily yielding to the small stamp-mill built at the mine. Years ago, when the trouble arose as to the title to the Maxwell grant, the mine was closed, but is now worked after the most primitive fashion by a man who has received a sheriff's title, subject to mortgage. He has taken out as high as $1000 a week with a single arastra There are 8 or 10 other leads in the locality. From Moreno Park, six miles to Elizabethtown, there are placer diggings, and at the town there is quite extensive hydraulic and sluice mining, the principal water supply being from a ditch 47 miles in length, and costing upward of $200,000."

## SOUTH CAROLINA.

Regarding the existence of paying gold deposits in the upper portion of this State, a letter to the New York *Times*, dated Greenville, S. C., May 10th, says:

"The much-disputed question wether the deposits of gold known to exist in the upper portion of the State will recompense the working of the mines, is about to be settled by John Cochran, late Chairman of the State Senate Investigating Committee. Gold had been discovered in some of the 'branches' (streamlets) in the southern portion of Oconee County, near the Anderson line, several years ago, but only within six months have steps been taken to utilize this knowledge to any extent. A recent visit to the mine opened by Mr. Cochran, on a wooded eminence on his plantation, situated about five miles from Seneca City, disclosed considerable activity in the line of 'drifting' and hauling quartz and 'pay dirt' to the surface. Workmen were also busily engaged in the erection of a quartz-mill.

"The mouth of the mine, on the north side of the hill, is entered by a well-ventilated tunnel 8 feet in height and 10 feet wide. From it, in almost every direction, lead drifts connected with shafts, ranging from 20 to 50 feet in depth. The veins run mostly east and west, and are claimed to be very rich. The material is brought to the mouth of the mine in wheelbarrows; here the quartz and dirt are separated, the former is stored and the latter is conveyed in carts to the 'washing-troughs,' which extend for about 200 yards along the foot of the hill. All of the miners, 28 in number, are colored men. One great drawback to the enterprise is the scarcity of water. The 'branch' used for washing purposes, except in rainy seasons, does not furnish enough water to conduct operations on a desirable scale, and there seems to be no possibility, except at an enormous expense, to remedy this defect. Coneross Creek, about five miles from the mine, could be made available only through very expensive machinery, as the water would have to be lifted fully 200 feet to bring it on a level with the mine. It is claimed by the inhabitants that a pan of dirt taken from the beds of the 'branches' in this region will yield from 50 to 75 cents' worth of gold. There are unmistakable signs of rich deposits; but until Mr. Cochran has thoroughly tested the material, about 600 tons being now on hand, it will be impossible to form a correct estimate of their extent and value."

## NEW PATENTS.

The following is a list of the new inventions relating to Iron, Coal, Mining Machinery, Chemical Apparatus, and the treating of Precious Metals, etc., from *The Official Gazette of the United States Patent Office*, for the two weeks ending May 6th, 1879:

WEEK ENDING APRIL 29TH.

| *No. of Patent.* | *Title of Invention.* | *Name of Inventor.* | *Residence.* |
|---|---|---|---|
| 214,759 | Apparatus for the Manufacture of Salt | A. H. Crawford | Liverpool, N. Y. |
| 214,764 | Pump | William Fagan | Washington, D. C. |
| 214,767 | Electric Telephone | Frederick K. Fitch (a) | Jersey City, N. J. |
| 214,769 | Air and Gas Compressor | William F. Garrison | Brooklyn, N. Y. |
| 214,783 | Ore-Washer | Thomas B. McConaughey | Newark, Del. |
| 214,817 | Pump-Attachment | William Gathany | Channahon, Ill. |
| 214,835 | System of Lighting | E. J. Molera | San Francisco, Cal. |
| 214,840 | Electric Speaking-Telephone | George M. Phelps | Brooklyn, N. Y. |
| 214,855 | Steam-Boiler | Frederick C. Weir | Cincinnati, O. |
| 214,954 | Cam for Stamp-Mills | Juan G. Ribon | Jersey City, N. J. |

MAY 6TH.

| | | | |
|---|---|---|---|
| 214,981 | Safety-Valve Attachment | Henry G. Ashton (b) | Somerville, Mass. |
| 215,001 | Tube Clamp for Oil-Wells | Isaac N. Hinderliter | Cranberry, Pa. |
| 215,002 | Force-Pump | Daniel B. Hiser (c) | Wooster, O. |
| 215,004 | Placer-Mining | Washington C. Kerr | Raleigh, N. C. |
| 215,010 | Railway Track | Osborne Macdaniel | New York, N. Y. |
| 215,026 | Direct-Acting Pump | Herman Strater, Jr. | Boston, Mass. |
| 215,064 | Slide and Steam-Valves | Alexander H. Mathesius | San Francisco, Cal. |
| 215,065 | Rolls for Utilizing the Fag-Ends of Steel RR. Rails | Malcolm McDowell | Chicago, Ill. |
| 215,067 | Hydraulic Testing-Machine | Tinius Olsen | Philadelphia, Pa. |
| 215,074 | Stamp-Mill | Chas. S. Stanchfield (d) | Oakland, Cal. |
| 215,096 | Refining Copper | Maria Chapman (e) | Dubois, Ill. |
| 215,101 | Rock-Drill | Uriah Cummings | Buffalo, N. Y. |
| 215,102 | Hoisting-Machine | Thomas N. Davey | Carthage, Mo. |
| 215,107 | Double-Acting Pump | Henry T. Drain | Tama City, Iowa. |
| 215,131 | Device for Extracting Teeth from Coal-Breaking Cylinders | Edward H. Jones | Wilkes-Barre, Pa. |
| 215,132 | Sliding-Valve for Rock-Drills | Thomas J. Murphy | New York, N. Y. |
| 215,181 | Processes and Apparatus for Washing Bituminous Coal | Sebastian Stutz | Pittsburg, Pa. |
| 215,199 | Explosive Compound | Adolf Dieckerhoff | Vienna, Austria. |

(a) Assignor to Samuel S. White, Philadelphia, Pa.
(b) " to the Ashton Valve Company.
(c) " of ½ his right to John K. McBride, same place.
(d) " " " " " John W. Preston, same place.
(e) " to herself and Annie Getchell, Boston, Mass.

## PROPOSALS.

For the benefit of many of our readers, we compile weekly such proposals and solicitations for contracts, etc., as may be of interest. The table indicates the character of proposals wanted, the full name and address of parties soliciting, and the latest date at which they will be received:

| | |
|---|---|
| Hospital Building; A. A. Lewis, Weston, W. Va | May 21, 1879. |
| Hose, 5000 feet, for Fire Department; Com. of the Department of Fire, Brooklyn | " 23, " |
| 550 tons Schuylkill Coal; Comm. of the Department of Fire and Buildings, Brooklyn | " " " |
| Building and Constructing Water-Works, 1,000,000 gallons capacity; Trustees of Water-Works, East Liverpool, O | " 24, " |
| Pumping-Engine, Construction of, including Foundations, etc.; Chief Engineer City Works, Brooklyn, N. Y | " 26, " |
| Harbor Improvement; S. M. Mansfield, Major of Engineers, Detroit, Mich. | " " " |
| Removal of Broken Rock from Hallett's Point Reef; John Newton, Lt.-Col. Corps of Engineers, Army Building | " 29, " |
| Erection of a State Capitol: James Smith, Secretary of State, Topeka, Kansas | June 2, " |
| Repairs for Old Pier; John M. Wilson, Major of Engineers, Cleveland, O. | " " " |
| Building; David W. Gibbs, Xenia, O | " 3, " |
| Bridge. Building Wagon-Bridge (Iron) over Cedar River, Iowa, 4 spans, 140 feet each; R. H. McCampbell, Auditor, Muscatine, Iowa | " 4, " |
| Metal-Work of Three Light-Houses; O. E. Babcock, Major of Engineers, U. S. A., Office of Light-House Board, Baltimore | " 7, " |
| Wrapping-Paper, Letter-Scales, etc.; D. M. Key, Postmaster-General, Washington, D. C | " 19, " |
| Designs for Pumping-Machinery, for which premiums will be paid, as follows: 1st best design, $500; 2d best, $300; 3d best, $200; W. E. Cutshaw, City Engineer, Richmond, Va | July 1, |
| 100,000 tons of Steel Rails to be Manufactured in New Zealand; John Knowles, Under Secretary for Public Works, Wellington, New Zealand | Sept. 30, " |

## STATISTICS OF COAL PRODUCTION.

*This is the only Report published that gives full and accurate returns of the production of our Anthracite mines.*

Comparative statement for the week ending May 10th, and years from January 1st:

| TONS OF 2240 LBS. | 1879. | | 1878. | |
|---|---|---|---|---|
| | Week. | Year. | Week. | Year. |
| *Wyoming Region.* | | | | |
| D. & H. Canal Co.. | 62,742 | 958,980 | 32,403 | 711,864 |
| D. L. & W. RR. Co. | 72,793 | 1,116,544 | 31,232 | 588,382 |
| Penn. Coal Co..... | 32,500 | 424,773 | 395 | 169,321 |
| L. V. RR. Co. ..... | 14,758 | 306,970 | 20,847 | 235,583 |
| P. & N. Y. RR. Co.. | 1,173 | 6,473 | 1,113 | 8,635 |
| C. RR. of N. J ..... | 46,174 | 597,052 | 18,881 | 284,310 |
| Penn. Canal Co..... | ... ..... | ..... | 9,885 | 42,547 |
| | 230,140 | 3,410,792 | 114,756 | 2,040,642 |
| *Lehigh Region.* | | | | |
| L. V. RR. Co..... | 82,502 | 941,837 | 47,246 | 713,149 |
| C. RR. of N. J..... | 57,994 | 688,288 | 35,378 | 345,340 |
| S. H. & W. B. RR.. | ..... | 8,774 | 206 | 7,325 |
| | 140,496 | 1,638,899 | 82,830 | 1,066,014 |
| *Schuylkill Region.* | | | | |
| P. & R. RR. Co .... | 160,664 | 2,257,806 | 169,945 | 1,177,740 |
| Shamokin & Lykens Val..... .... | 20,239 | 248,430 | 10,691 | 185,647 |
| | 180,903 | 2,506,236 | 180,636 | 1,363,387 |
| *Sullivan Region.* | | | | |
| Sul. & Erie RR. Co. | 891 | 17,868 | 255 | 10,452 |
| Total ..... | 552,430 | 7,573,795 | 378,477 | 4,480,495 |
| Increase..... | 173,953 | 3,093,000 | ..... | ..... |
| Decrease ..... | ..... | ..... | ..... | ..... |

The above table does not include the amount of coal consumed and sold at the mines, which is about five per cent of the whole production.

*The increase of shipments of Cumberland Coal* over the Cumberland Branch, and Cumberland and Pennsylvania railroads, amounts to 71,551 tons, as compared with the corresponding period in 1878.

*Belvidere Delaware Railroad Report for week ending May 10th:*

| | Week. | Year. 1879. | Year 1878. |
|---|---|---|---|
| Coal for shipment at Coal Port (Trenton) ..... ..... | ..... | ..... | 649 |
| Coal for shipment at South Amboy | 13,130 | 158,897 | 166,558 |
| Coal for distribution..... | 7,498 | 117,478 | 57,639 |
| Coal for Company's use .. ..... | 1,345 | 30,700 | 29,967 |

*The receipts of coal at Providence*, from January 1st to May 10th, were as follows:

| | 1879. | 1878. |
|---|---|---|
| From Philadelphia... ..... | 21,666 | 30,522 |
| From New York..... | 126,665 | 87,706 |
| Soft coal..... | 19,522 | 19,952 |
| Total..... | 167,793 | 138,180 |

*Receipts and shipments of coal at Chicago Ill.*, for the week ending May 10th, and year from January 1st:

| | Week. Tons. | Year. Tons. |
|---|---|---|
| Receipts..... | 70,431 | 617,980 |
| Shipments..... | 7,042 | 137,482 |
| *Perth Amboy Business:* | | Tons. |
| Received for the week . ..... | | 35,021 |
| Shipped for the week.... ..... | | 39,914 |
| On hand May 15th. ..... . ..... | | 147,771 |

**The Production of Bituminous Coal** for the week ending May 10th was as follows:

Tons of 2000 lbs., unless otherwise designated.

| | Week. Tons. | Year. Tons. |
|---|---|---|
| *Cumberland Region, Md.* | | |
| Tons of 2240 lb ..... | 37,598 | 453,545 |
| *Barclay Region, Pa.* | | |
| Barclay R. R., tons of 2,240 lbs..... | 4,496 | 128,383 |
| *Broad Top Region, Pa.* | | |
| Huntingdon and Broad Top R. R..... | 3,102 | 50,480 |
| *East Broad Top..... | 1,391 | 19,117 |
| *Clearfield Region, Pa.* | | |
| *Snow Shoe.... ..... ..... | 490 | 6,184 |
| *Tyrone and Clearfield..... . ....29,346 | | 375,001 |
| *Allegheny Region, Pa.* | | |
| *Pennsylvania R. R ..... | 5,074 | 50,582 |
| *Pittsburg Region, Pa.* | | |
| *West Penn R. R.... ... ... ... ..... | 4,226 | 58,249 |
| *Southwest Penn. R. R..... ..... .. | 704 | 10,297 |
| * Penn & Westmoreland gas coal, Pa. R. R..... .....19,269 | | 239,420 |
| *Pennsylvania R. R..... ..... .. | 7,884 | 118,904 |

*For the week ending April 14th.

**The Production of Coke** for the week ending April 14th:

| Tons of 2000 lbs. | Week | Year. |
|---|---|---|
| West Penn R. R.... ... ..... .... | 1,155 | 27,985 |
| Southwest Penn. R. R..... | 5,499 | 247,003 |
| Penn. & Westmoreland Region, Pa. R. R. | 1,557 | 33,187 |
| Pittsburg, Penn. R. R... ..... ..... | 2,820 | 43,612 |
| Penn. R R. (Allegheny Region)..... | 371 | 14,857 |
| Total... ... .... ... ...11,402 | | 356,644 |

## THE COAL TRADE REVIEW.

NEW YORK, Friday Evening, May 16, 1879.

### Anthracite.

The order-books are still very well filled, yet some of the orders are likely to be wiped off, owing to too low limits being placed on freights, which are very firm, caused by the great demand for vessels. There are still a good many orders being entered, but the demand is falling off. Prices, although as low as at any time, are very firm, and show a tendency to advance.

Much speculation has existed during the week as to the prospects of a coal combination in case Judge Packer, who is very ill, should die; and the prices of the coal stocks have advanced, apparently from the prospects of his death. Should he die, it is very probable that Robert H. Sayre would be made President of the Lehigh Valley Railroad Company, and as he has been Judge Packer's principal adviser for years, it is questionable if any sudden change of policy would be made. It seems to be forgotten that efforts toward a combination now are to get a meeting to discuss the subject. Should that be accomplished, a combination would still be a great way off, especially now, as the Reading Company has leased the North Pennsylvania and Bound Brook railways. Yesterday's Philadelphia *Ledger* says of this lease:

"Yesterday afternoon the Philadelphia & Reading Railroad Company took possession of the railroads of the North Pennsylvania Railroad Company and the Delaware & Bound Brook Railroad Company, under leases for nine hundred and ninety years. We are informed by the officers of the Philadelphia & Reading Railroad Company that the principal object in leasing these lines was to secure an independent outlet for coals by rail to the waters of New York Bay. The coal tonnage of the Reading Company destined for the waters of New York is from one million to one million and a half of tons, and, with proper facilities for its transportation and delivery, the volume of this traffic is, of course, capable of great expansion in the future. With the new line, in connection with the Central Railroad of New Jersey, the Reading Railroad Company will, in common with the other principal transporters and miners of coal, have its own line into New York and be no longer shut out of that market during the winter months. The present actual cash cost to the Reading Company for moving coal from Philadelphia to New York is 85 cents per ton; but by the new railroad and continuations of the present rail route it can readily be done for 50 cents per ton, which will amount to a cash saving of several hundred thousand dollars a year to the company. We understand that it is the intention of the Reading Company to make its Ninth and Green street station the Philadelphia terminus of the leased lines, and it is expected that the increased local passenger traffic to be secured by the change of station will add largely to the receipts of both roads. The terms of the leases provide for annual rentals, payable quarterly, sufficient in amount to pay the interest on the obligations of each of the two leased companies, and to give to the shareholders of each dividends of six per cent for the first two years, seven per cent for the next two years, and eight per cent for all subsequent years. It is expected that these rentals will be about $60,000 per annum more than the present traffic would justify; but it is believed that the change of terminus will at once add to the receipts of the line very much more than the above deficiency, and thus practically give to the Reading Railroad an outlet to New York for coal, without any additional cost whatever, except that of the trains engaged in hauling it, the wear and tear of roadway, and the moderate trackage payment to be made to the Central Railroad of New Jersey for the use of about twenty-five miles of its line, leaving the large amount of saving per annum on coal transportation to the credit of the Reading Company as its profit on the transaction. When we take into consideration the large deficits annually paid by some of our greatest companies as the result of the traffic upon the lines they have either built or leased in order to get a terminal outlet in New York, it will be considered greatly to the benefit of the Reading Company that it has been able to accomplish the same end, not only without loss, but with the strongest probability of actual gain."

A very important result of this lease will be to give the Reading Company a practical control of the Philadelphia market. The Lehigh Canal can be used for putting into that market a limited amount of coal, while the Lehigh Valley RR. Co. can ship via the Belvidere & Delaware RR. from Easton. This route does not, however, offer suitable facilities for supplying the trade.

The report of the Delaware & Hudson Canal Co. for 1878 shows that, although this company sold more coal in that year under a combination than it did in 1877 under free competition, the increase in profits or rather decrease of losses was not 50c. per ton. Under the circumstances, therefore, considering that the production was very much curtailed by a long strike during 1877, we can not see what advantage a combination is to that company.

A dispatch from Harrisburg, yesterday, says:

"After a very excited discussion of the General Revenue bill in the House of Representatives to-day, the members from the coal counties scored a signal victory in reducing the tax on anthracite and bituminous coal from 3 cents to 1 cent a ton. The reduction was strongly opposed by Wolfe, of Union County, and as strongly advocated by Hill, of Allegheny; Barrett, of Scranton, and others. The debate was exceedingly spicy, and rendered all the more interesting from the fact that the representatives from the great oil-producing regions feared it would result in the taxation of petroleum. The fears were almost realized, as a motion to tax oil 2 cents a barrel was pending at the hour of adjournment, with a prospect of adoption. A strong lobby is here from the oil region, fighting the coal tax, and a great deal of feeling has been evoked on the subject."

Our Philadelphia correspondent says:

The coal trade is active here for all sizes, but without improvement in prices. Vessels have been more plenty in the beginning of the week, and freights weakened some—$1.50 being the rate to Boston—but the fleet disappeared like a mist, and rates are now stiffer, $1.55 being offered. Small vessels are very scarce.

The trade is much excited over the lease of the North Pennsylvania and Bound Brook Railroads by the Reading. It will give to the Schuylkill Region a permanent shipping point in New York bay, open for the whole year, and benefit the region very much. Such an outlet has been sadly needed by the Schuylkill region for many years past, and this arrangement can not but be welcome to all parties interested in the property of the Schuylkill region.

The production of anthracite coal last week was 552,430 tons, as compared with 451,686 tons the previous week, and 378,477 tons the corresponding week of 1878. The total output from January 1st to May 10th was 7,573,795 tons, as against 4,480,495 tons for the like period of last year, showing an increase this year of 3,093,000 tons.

### Bituminous.

A liberal general business in a small way is reported, but there is nothing of importance to note. Some producers who sold coal at very low prices, delivered, are suffering very much by the high freights that are prevailing, with but little chance of much of a decline. Prices of bituminous coal continue to be very low, there being a strong competition among the producers of this class of coal.

We have the following from our Chicago correspondent, dated May 8th:

"The prices of coal have ceased vibrating and settled down to the following:

| | | |
|---|---|---|
| Lackawanna, all sizes .. ..... | $4.50 | delivered. |
| Erie and Brier Hill coal..... | 5.00 | " |
| Wilmington " ..... ... | 3.00 | " |
| Other Illinois " ..... | 3.00 | " |
| Blossburg " ..... ... | 4.50 | " |

"The extremely low price of anthracite coal in this market is bringing out orders liberally, for immediate delivery.

"Only a few cargoes by lake, received up to this date, and those mostly Brier Hill coal from Cleveland."

The following is dated Buffalo, May 14th:

"Trade in coals at this point may be called fairly active in the anthracite varieties and dull in the bituminous: but both sorts, when moved at all, are at extremely low prices.

"Bids were opened yesterday for the supply of the Fire Department for the year. It was awarded to Lee & Loomis, of this city, at $3 per ton of 2000 lbs., for all sizes of anthracite, delivered, and $4 for Brier Hill lump.

"One or two more bids will be called for soon, and then the city will have purchased its full supply.

"Consumers are certainly reaping a benefit this year in the low price of fuel, whatever may be said of the results to the producers. We see no abatement in the war at this end of Clinton's ditch."

From the same city we have the following, dated 15th instant:

"The condition of the coal trade remains as previously reported.

"While the demand at the present low prices is brisk, the facility for filling orders is so great that none of the pioneers for the Western trade seem willing to decline the tonnage offered.

"Local retail trade has got down to a basis of wholesale prices."

The San Francisco *Commercial Herald* of May 8th says:

"Imports from January 1st to May 1st:

| | Tons. | | Tons. |
|---|---|---|---|
| Anthracite..... ..... | 3,268 | Cumberland..... | 887 |
| Australian..... ..... | 4,478 | Seattle..... ..... | 49,003 |
| Coos Bay ..... | 13,290 | Tacoma..... | 845 |
| Carbondale..... ... | 746 | Vancouver Island.... | 50,674 |
| Carmel Bay..... | 270 | | |

"Anthracite, ex ship, part Lehigh and part Pittston, has been sold at $8.50. The cargo of 525 tons Wallsend, per Gustave from Newcastle N. S. W., was sold long since to arrive at $8, considerably above what it could be sold for to-day. The general market is very sluggish, and prices both low and nominal. In this state of things our quotations are not exact, which is impossible under present circumstances. The arrivals during the week embrace the following: Gussie Telfair, 372 tons Coos Bay; Laura May, 350 tons same, price $5.75 ex ship; Alaska, 2180 tons Seattle, price $7; Nanaimo, $7; Wellington, $8 by the cargo; California Steam Mt. Diablo, $4@$5.

## IRON MARKET REVIEW.

NEW YORK, Friday Evening, May 16, 1879.

**American Pig.**—From some offices we get the report that the demand is very light, while at the same time we learn that the Thomas Iron Co. has sold 2000 tons of forge iron at $16, 1500 tons of No. 2 Foundry at $17, and 500 tons of No. 1 Foundry at $18.50. We also learn of important inquiries. Prices are very strong and rather inclined to advance, although we do not look for any important change for some time. We quote: No. 1 Foundry at $18@$19; No. 2 Foundry, $17; and Forge, $16.

**Scotch Pig** is very dull. The arrivals during the week have been from 1000 to 1200 tons. We quote Eglinton at $19@$19.50; Coltness, $22; and Gartsherrie, $21.50.

**Rails.**—We learn of a sale of 5000 tons of steel rails at $45 at tide-water, with inquiries for next year's delivery at same figure. We also note a sale of 4000 tons of iron rails, and 2000 tons of steel rails on private terms, and of several hundred tons of steel rails for early delivery at $47 at tide-water. The rail business is the most encouraging of any branch of the

iron trade. We quote steel rails at $45 and iron rails at $37@$38, both at tide-water.

**Old Rails.**—We learn of no business, and quote nominally at $21.

**Wrought Scrap.**—There has been a lull in the demand for this article, and late arrivals have had to be sold at a concession. We note 500 tons sold at the reduced price, and quote at $23@$24.

---

**Pig-Iron.**—The following, from St. Louis, is dated May 12th:

"There is no change in the pig-iron market and the season is about ended. We quote same as last week."

Our Baltimore correspondent writes, May 12th:

"We have no material change to report in the iron market, the demand for best wheel-irons and C. B. blooms being about equal to present production. Prices are unchanged."

Messrs. King, Gilbert & Warner, of Columbus, write, under date of May 13th:

"There has been a fair demand for pig iron during the past week. Consumers seem willing to duplicate recent orders without asking for concessions, which is very good evidence of the tone of the market. Sales made are mostly for immediate delivery. Prices are unchanged."

Louisville advices of the same date say:

"There has been no change in the market since our last report. The demand is very light, but furnaces generally, having sold largely ahead, are not pressing sales, and prices are without change."

## METALS.

NEW YORK, Friday Evening, May 16, 1879.

In lead and copper, a large business has been reported, but otherwise the market in a wholesale way has been very quiet. There has, however, been a good jobbing business, and the outlook is encouraging.

**Copper.**—It is reported that 5,000,000 lbs. of copper have been sold to manufacturers at 16½c. We have been unable to confirm this, although it is largely credited. We have been doing a very large export business this year, so much so as to have caused the belief that sales on foreign account had been made, and had not come to the knowledge of the public. It is now said that in a quiet way, mostly direct with the producing companies, there have been sold from 4000 to 5000 tons to go abroad, deliveries extending up to September. These sales do not, however, appear to have affected the market much, for the price at the close is but 16¼c.

Messrs. Vivian, Younger & Bond, of London, under date of May 2d, say of copper:

"The market was already showing some symptoms of greater steadiness at the close of our last monthly report, Chili bars being in demand at £56, when news came to hand from Valparaiso that war had at length broken out between Chili and Bolivia, Peru joining the latter in an offensive and defensive alliance. This intelligence attracted speculators; bars speedily advanced to £58 10s. spot, and £59 10s. three months prompt, with a considerable business, in which the trade participated up to the highest point reached. The intervention of the Easter holidays, and the announcement of the auctions for the 22d ult. produced a pause, and some reaction set in. The public sales were disappointing, and depressed the market. Bars declined to £57 for specials, and £56 10s. for g. o. b., a few sales having since been made at 10s. to 15s. per ton below these prices from second hands. At the close the market is steadier. Deliveries show some improvement, and a good deal of precipitate has been cleared off.

"The charters of copper produce advised by cablegram from Valparaiso represent 3700 tons in fine copper for the month of April.

"The quantity of Chili bars, ores, and regulus in stock at, and afloat for, Liverpool, Swansea, and Havre, and of English and foreign copper in London, is thus estimated in fine copper:

| | May 1st, 1879. Tons. | April 1st, 1879. Tons. |
|---|---|---|
| Stock | 40,156 | 39,173 |
| Chili produce, shipping and afloat, per mail advices | 7,300 | 9,300 |
| Total | 47,456 | 48,473 |
| Chili produce chartered for per cable advices received up to date | 2,600 | 2,700 |
| Australian produce afloat | 700 | 1,900 |

**Tin.**—There has been no important business, although this article is receiving increased attention. Straits is quoted at 14⅜@14½c.; L. & F., 14⅝c.; Refined, nominal at 15c. Straits in London is quoted at £66 10s. to-day, although it has been lower during the week. Singapore quotes at $20.50, and Penang, $19.90, with exchange at 3s. 8¾d.

Messrs. Vivian, Younger & Bond, of London, say of tin:

"Foreign has fluctuated throughout the past month between 69s. 6d. and 68s. 6d., and, though with dull markets, the price has been sustained. A new feature is the arrival of Straits from America; and, looking at the statistics of that market, it would seem that the quantities of Straits, Australian, and Billiton taken thither form a supply much in excess of the probable requirements, so that further shipments may be expected here from that quarter. English still rules relatively cheaper than foreign, at £8s. for common ingot, and in limited demand thereat.

"The deliveries of foreign for the month were 795 tons from Holland (including 7300 slabs transhipped to America), and from London 2050 tons, inclusive of 1020 tons Straits in transit for America.

"The April shipments are estimated as 475 tons from the Straits and 670 tons from Australia.

"The stock of foreign tin in London and Holland is thus estimated:

| | 1879. April 1st. Tons. | 1879. May 1st. Tons. | 1878. May 1st. Tons. |
|---|---|---|---|
| Foreign tin in London | 10,019 | 10,524 | 9,231 |
| Banca tin in Holland | 2,051 | 1,745 | 1,144 |
| " in Company's hands | 432 | 1,123 | 506 |
| Billiton tin in Holland | 2,048 | 2,177 | 1,854 |
| Total | 14,550 | 15,569 | 12,735 |
| Quantity of tin afloat for Europe. | 4,500 | 3,800 | 4,000 |

**Tin Plates.**—There has been a fair jobbing demand, but no large transactions. We quote, per box, as follows: Charcoal, bright, ⅛ X, Melyn grade, at $6.37½@$6.50; Allaway grade, $6.25; charcoal ternes, Allaway grade, $5.50@$5.75; coke, bright, B. V. grade, $5.25, and coke roofing, 14 × 20, $5.

Messrs. Robert Crooks & Co., of Liverpool, under date of May 1st, say of tin and terne plates:

"Coke makers, finding it impossible to maintain their established price of 16s. 6d., are going to meet and discuss the propriety of further reducing make. It is doubtful whether or not they will agree to this, as further diminution in make means increased cost per box. Coke ternes are in small make, and comparatively dear, as are charcoal ternes of all sorts, while in charcoal tins, the only descriptions that are at all firm are the fancy brands. These have been heavily booked, and will not have to be pressed for sale for some time."

**Lead.**—It is estimated that the sales for the last two weeks have amounted to about 5000 tons, for delivery in May, June, and July—300 tons reported by us last week. The sales include 800 tons of Selby, 360 tons of Richmond, and 3000 tons (Eureka) Newark, at 3c. A large portion of this lead went to speculators, so that the statistical position is but little, if any, improved. Since these sales, there have been about 50 tons sold at 3⅛c., which is the closing price.

The shipments of lead from London and Liverpool were:

| | To China. Tons. | To Japan. Tons. |
|---|---|---|
| April, 1879 | 703 | .... |
| First four months, 1879 | 3,483 | 79 |
| " " " 1878 | 4,435 | 597 |
| " " " 1877 | 6,454 | 91 |

Messrs. Vivian, Younger & Bond, of London, say of lead:

"Lead has lost most of the advance established in March; £14 is now the highest quotation for English, and £13 5s. for soft Spanish; silver-lead is worth £13 to £13 5s., to sell as in quality. The home trade has become very slack, and the export demand limited."

**Spelter and Zinc.**—Spelter is dull at 4½c., and sheet zinc at 6@6½c.

**Antimony** is quiet at 11¼@11⅝c. for Hallett's, and 12c. nominal for Cookson's.

**Quicksilver.**—The *Commercial Herald* of May 8th says: "The demand for China is continued. The steamer of the 16th will take a liberal shipment to Hong Kong, based upon the present nominal price of 36c. The City of Peking, hence on the 1st inst., carried 2950 flasks. The Colima, for Central America, carried 14 flasks, and to Mexican ports, 300 flasks."

## FREIGHTS.

### Lake Freights on Coal and Iron Ore.

*Representing the latest actual charters up to May 14th, 1879.*

Free in and out to the vessel:

| From | To | Rate Per ton. | From | To | Rate Per ton. |
|---|---|---|---|---|---|
| Ashtabula | Chicago | $0.50 | Buffalo | Saginaw | $0.40 |
| Black Riv. | Port Huron | 35 | " | Toledo | 15 |
| " | Milwaukee | 40 | Cleveland | Muskegon | .. |
| Buffalo | Cleveland | 15 | " | Chicago | 50 |
| " | Chicago | 30 | " | Severn Bay | .. |
| " | Milwaukee | 30 | " | Milwaukee | 50 |
| " | Detroit | 15 | " | Detroit | 30 |
| " | Bay City | 35 | " | Pt. Stanley | 30 |
| " | Duluth | 50 | " | Racine | 50 |
| " | Green Bay | 40 | Fairport | Buffalo | 50 |
| " | Marquette | 40 | " | Port Huron | 30 |
| " | Racine | 40 | .... | .... | .... |

Our Buffalo correspondent writes:

"The harbor is full of ice, but tugs are pulling vessels through."

## THE BULLION MARKET.

NEW YORK, Friday Evening, May 16, 1879.

The market has weakened in London since the award of the Indian Council bill on Wednesday last, at a decline of one eighth of a penny per rupee, and the sale by the German government of about one and a half million dollars of silver the past week. It is nominal to-day at the rates quoted below, and has the appearance of going lower.

San Francisco quotes at 16 per cent discount.

DAILY RANGE OF SILVER IN LONDON AND NEW YORK, PER OZ

| DATE. | London Pence. | N. Y. Cents. | DATE. | London Pence. | N. Y. Cents. |
|---|---|---|---|---|---|
| May 10 .... | 50⅛ | 109¼ | May 14. | 50⅛ | 109¼ |
| May 12. ... | 50⅛ | 109¼ | May 15. | 50 1-16 | 109¼ |
| May 13. .... | 50⅛ | 109¼ | May 16. | 49¾@50 | 108¾ |

BULLION SHIPMENTS.

We give below a statement showing the latest bullion shipments in addition to those announced in our issue of May 10th:

| | | | |
|---|---|---|---|
| April 27th | Martin White | Nev | $8,199.00 |
| " 28th | Northern Belle | " | 3,018.00 |
| " 29th | Ophir | " | 20,017.00 |
| May 2d | Star | " | 4,600.00 |
| " 3d | Alexander | " | 9,958.00 |
| " 4th | Hillside | " | 5,220.00 |
| " 4th | Manhattan | " | 11,200.00 |
| " 3d | Paradise Valley | " | 5,727.18 |
| April 29th | Bulwer | Cal | 20,076.00 |
| " 29th | Standard | " | 17,608.00 |
| May 2d | Crimson Mammoth | Utah | 1,528.21 |
| " 6th | Ely Mill | " | 1,300.00 |
| " 7th | Leeds | " | 4,757.79 |
| " 8th | Silver Reef | " | 10,178.38 |

*Horn-Silver Bullion.*—Messrs. Warnock & Co., York, total received from April 27th to May 3d, 214,399 lbs.; on hand April 26th, 942,259 lbs.

Bodie District shipped from April 1st to 30th $208,592.14, distributed as follows: Bulwer, $101,687.22; Standard, $82,417.41; Noonday, $12,981.46; Bechtel, $11,506.05.

*The Homestake Mining Co.'s* mill produced $52,000 for a 20-days' run in April.

*The Ophir* produced $69,695 in April.

*Silver Reef District, Utah,* produced $114,600 refined bullion during April.

*Utah Notes.*—The Mingo smelter is running one stack only.

Mr. Conklin, of Salt Lake, is erecting concentrating works at the mouth of Butterfield Cañon, expecting to commence operations in about two weeks.

*Product of the Lyon County (Nevada) Tailings Mills.*—Following is an abstract statement from the quarterly assessment roll of the proceeds of the mines of Lyon County, for the quarter ending March 31st, 1879:

| MILLS. (Tailings.) | No. tons worked. | Value per ton. | Gross yield or value. |
|---|---|---|---|
| L. M. and M'g Co | 455 | $15.61 | $7,103.37 |
| Trench Mill | 2,090 | 7.92 | 16,565.95 |
| Woodworth Mill | 12,900 | 2.68 | 34,656.61 |
| Eureka Mill | 12,390 | 2.89 | 35,854.21 |
| Total | 27,835 | .... | $94,180.14 |

| MILLS. (Tailings.) | Cost of reduction or sale. | Total cost. |
|---|---|---|
| L. M. and M'g Co | $3,412.50 | $3,867.50 |
| Trench Mill | 8,174.75 | 8,174.75 |
| Woodworth Mill | 28,398.63 | 28,398.63 |
| Eureka Mill | 22,976.30 | 32,268.80 |
| Total | $62,962.18 | $72,709.68 |

*Exports of Gold and Silver.*

| | |
|---|---|
| Week ending May 10th | $286,199 |
| Corresponding week last year | 69,158 |
| Since January 1st this year | 6,943,490 |
| Corresponding period last year | 7,293,932 |

*Gold Interest Paid Out by the Treasury.*

| | |
|---|---|
| Week ending May 10th | $1,410,650 |
| Corresponding week last year | 1,297,967 |
| Since January 1st this year | 25,350,550 |
| Corresponding period last year | 26,551,404 |

SAN FRANCISCO, Cal., May 15, 1879.

The Nevada Bank has sold 100,000 ounces of silver to the government, for the mint here, at 110⅝. A tender of a small quantity by the Bank of California at 110½ was declined.

The silver question was discussed at a Cabinet meeting in Washington on the 14th inst., and it was determined to open a new correspondence with various European governments on the question of the use of silver.

The Secretary of the Treasury, on the 13th inst., accepted bids for 100,000 ounces of silver bullion for the New Orleans mint, and a somewhat larger quantity for the mint at San Francisco.

*Sale of Silver by Germany.*—LONDON, May 13.—Germany sold £100,000 worth of silver yesterday, at 50¼d. per ounce. An increased flow of silver to China and Japan from the continent this season is anticipated, owing to the prospective lessening of the silk product caused by the cold winds keeping back the mulberry leaves, upon which the silk-worm feeds.

The Beaconsfield mine, of Winnemucca, Nev., shipped on the 2d inst. forty-two bars of lead and silver bullion to San Francisco. The bullion contains over $500 per ton in silver. Fifteen tons of ore produced about two tons of bullion. There is plenty of ore at the mine and several tons at the furnace; but the furnace is not running at present.

The Martin White Company shipped on the 2d inst. 12 bars of bullion, valued at $12,376.68. During the month of April this company shipped bullion valued at $67,225.44.

A run of four days on ordinary ore from the Oro Bonito mine, Arizona, with four arastras, resulted in the production of a bar of gold bullion weighing 56½ ounces, worth about $850.

The shipments of gold bullion from Gilpin County, during the week ending May 3d aggregated $24,000, the product of the stamp mills alone. All the richer products of the mines go to the smelters, and no definite account of them is published until the close of the year.

The Superintendent of the Alps-Mackie, Cleveland Company's mines, reports under date of May 11th, that the

milling ore is yielding $14 per ton, and that he was offered $336 per ton net for the smelting ore produced during the operations of the week.

*Bonanza Bullion* shipments are as under, shipped on May 5th: Consolidated Virginia, $21,094.63; California, $52,353.07; Ophir, $11,442.40. The totals for the fiscal month of April are as follows: Consolidated Virginia, $253,458.01; California, $426,282.31; Ophir, $51,136.90.

*Bodie Shipments* from April 1st to the 30th are reported as under:

| | |
|---|---|
| Bulwer | $101,687.22 |
| Standard | 82,417.41 |
| Noonday | 12,981.46 |
| Bechtel | 11,506.05 |
| Total from four mines | $208,592.14 |

It should be remembered that these figures show the actual shipments from the first to the last day of the month. The fiscal month of the several companies ends about the 10th, and therefore the official reports differ somewhat from the figures. The Noonday is credited only with the production of the Syndicate mill, and not with that at the Miners', where the clean-up has not yet been made.

Compared with last year, the Bodie bullion output thus far shows the following gratifying increase:

| | 1878. | 1879. |
|---|---|---|
| January | $111,567.97 | $197,921.16 |
| February | 84,373.50 | 136,714.44 |
| March | 78,449.77 | 189,403.76 |
| April | 76,619.33 | 208,592.14 |
| Total | $351,010.57 | $732,631.50 |
| Total first four months in 1878 | 351,010.57 | |
| Increase thus far this year | | $381,620 93 |

*Silver Legislation in Congress*—Another silver scheme, called the Warner Silver Bill, and which in effect provides for unlimited coinage, is now engaging the principal attention of Congress. Yesterday's advices from Washington summarize the position of the measure as follows:

1. It makes the silver dollar weighing 412½ grains a "unit," as well as the gold dollar weighing 25 8-10 grains.
2. It authorizes the free coinage of silver bullion into standard dollars for the benefit of the depositor.
3. It provides for the redemption of subsidiary silver coins in legal-tender money.
4. It requires the Secretary of the Treasury to receive silver coin and bullion on deposit and to issue certificates therefor on the same terms on which he is now required to receive gold coin and bullion.
5. It stops the coinage of standard silver dollars on government account.
6. It directs the President to reopen diplomatic negotiations for the establishment of a common international mint ratio between the values of gold and silver.
7. It makes no further provision for the coinage of the trade-dollar.

An amendment was proposed in the House to allow the government to pay for all bullion deposited at the mints at the current market rate, but this was rejected by one majority. The closeness of this last vote alarmed the advocates of the measure, and an adjournment was carried.

### Salt Lake Ore and Metal Market.

The *Inter-Ocean's* correspondent, under date of May 5th, says:

"The shipments of bullion from Salt Lake City for the week ending May 3d were as follows: Five cars bullion to Pittsburg; 3 cars bullion to Omaha; total, 8 cars, 171,717 pounds. This is the smallest week's shipment for the past seven years.

"The lead market in New York looks a little favorable for an advance, but the highest price offered here for the past week has been $20 per ton. There is no mining section of the world that can produce lead and sell it in any market on earth for $20 per ton.

"Our mines are looking well, and can produce largely; but no great amount of mining will be done till prices are better."

*Ore and Bullion Shipments from San Francisco.*—We note the following recent shipments from San Francisco to New York: "The Colima carried of base bullion, 62,686 lbs.; copper cement, 11,788 lbs.; copper, 15 bbls.; pig lead, 999,974 lbs.; 750 bars Union base bullion, 31 tons, valued at $9000; 2418 bars Melrose base bullion, 135 tons, valued at $35,864; 5287 bars Richmond lead, 365 tons, valued at $26,000. The Pharos carried 627 tons lead, 300 tons chrome ore, 212 tons onyx marble. The City of Peking, for Japan, carried 60,000 lbs. pig lead."

## FINANCIAL.

### Gold and Silver Stocks.

NEW YORK, Friday Evening, May 16, 1879.

The total number of shares sold this week shows a falling off as compared with last week. There is not, however, a decline in the interest taken in mining, and the prospects are very favorable to a steadily increasing business in mining stocks.

The dealings in San Francisco stocks have not been so large this week as last, but yet they have been quite important. Bodie has advanced from $9½ early in the week to $11¾, with total sales of 495 shares. California records 1315 shares under a weakening tendency, selling from $7⅝ last Saturday down to $6¼ to-day. Consolidated Virginia has failed to sympathize with the general San Francisco list, and has sold from $8 down to $7, the total sales being 8395 shares. The dealings in Crown Point have been unusually large for this market, amounting to 1310 shares, opening at $4.50 and selling up to $4.80, the latter price being attained to-day. Grand Prize has been quiet, the sales amounting to but 160 shares, at $3.50. Independence has been weak and neglected, the sales amounting to but 625 shares, at $3@$2.70; 50 shares of Yellow Jacket sold at $13¾. Bechtel records 100 shares, at $1.05. Consolidated Imperial has been fairly active and strong during the past few days. The sales for the week amount to 2760 shares, at $1.10@$1.50. Consolidated Pacific has sold at $3.25@$3.50, with total sales of 630 shares. One hundred shares of Hussey sold at 11c.; 100 Julia, at $3⅝; 400 Leviathan, at 50@55c.; and 10 Mexican, at $28@$30. Tuscarora has been very quiet, the sales amounting to but 2100 shares, at 16@14c. Silver Hill has made its appearance in this market, the sales amounting to 200 shares, at $1.50 @$2. Favorable indications are reported in this mine. 375 shares of Leeds sold at 80c., and 100 Leopard at $1.

There is quite a falling off in the business in mining stocks at the New York Stock Exchange. Homestake has been quite active and strong, the sales amounting to 1973 shares at $34⅛@$35. Ontario has been quiet but strong at $38½@$39, with sales of 225 shares. There has been quite a falling off in the dealings in Standard, although there has still been a good business, the sales amounting to 3755 shares, at $30⅛@$28¾. In Mariposa the sales of preferred stock have amounted to 500 shares, at $7¾@$7, and 1305 shares of common, at $8@$6½. Quicksilver has been quite active, advancing early in the week, but losing all before the close. The sales of the preferred stock amount to 6888 shares, at $46@$41, and of common, 2500, at $15@$14. Sutro Tunnel has ranged between $4¾ and $4½, with sales of 10,300 shares.

In the better class of mines at the Mining Exchange there has been a very active business. Leadville has been the leading attraction. The dealings in this stock have amounted to the unprecedented number for this stock of 21,070 shares. The stock sold as low as $3.30 last Saturday; but upon the announcement of a dividend to-day, the price advanced to $3.90—seller 60 days. Moose has also been very active, but the tendency of the price has been very weak. On Saturday it sold at $3.75, and on Wednesday at $2.95, recovering to $3.10 the following day, but selling down to $3 to-day. The total sales of this stock for the week were 10,100 shares. Findley weakened from 60c. on Saturday to 55c. yesterday, but recovered to 58c. to-day upon the announcement of a dividend. This company has ordered an entirely new 40-stamp mill, to be run by a turbine wheel. Hukill has sold to the extent of 400 shares, at $2.55@$2.65. Plumas was somewhat neglected during a portion of the week. The sales amount to 1050 shares, at $3.65@$3.35@ $3.60, closing at $3.60, buyer, 30. Trio records 2000 shares, at 55@63c.

One hundred shares of the Caledonia mine, of the Black Hills, were sold at $4¼@$4. Cleveland has taken a prominent position on the list, the sales amounting to 9800 shares, at $2.25@$2.75.

The "fancies" have been fairly active. Buckeye has been the leading attraction, the sales amounting to 105,700 shares, at 63@54@62c., closing at 59c. Bertha & Edith has been fairly active, the sales amounting to 74,492 shares, at 50@ 34c.; Dahlonega records 27,400 shares, at 25@28c.; Gold Placer, 12,400, at 29@25c.; Granville, 2000, at 20@23c.; Lacrosse, 9000, at 28@30c.

The first week's work in May at the Caribou mine gave 6684 ounces of silver. The stock is meeting with a good sale.

Advices from the Plumas mine report a very satisfactory production this month.

The Green Mountain stock is moving fairly, at $2 per share.

Findley has declared a dividend of 1 per cent from April earnings.

The Homestake Mining Company has declared a dividend of 30c. per share for April, payable at Wells, Fargo & Co.'s on the 26th inst. The product of the mine for 20 days in April was $52,000.

The following are the Dunderberg Mining Company's newly-elected officers: J. Warren Brown, President; Charles Dennis, Vice-President; Walter T. Hatch, Treasurer; H. S. Bradford, Secretary.

The production of the Ontario mine from May 1st to 9th was $36,353.14, assay value.

The Leadville Mining Co. has declared its third monthly dividend of 10c. per share. The company has issued the following notice:

OFFICE LEADVILLE MINING COMPANY,
NO. 57 BROADWAY.
NEW YORK, May 15, 1879.

DIVIDEND NO. 3.

The Board of Trustees have this day declared a dividend of ONE PER CENT (10 cents per share) on the capital stock of this company ($2,000,000), out of net earnings, payable at the office of the company on and after June 7th, 1879. Transfer-books will close on May 31st, and reopen June 10th. J. S. LOCKWOOD, Secretary.

The Shamrock mine has been capitalized at $2,000,000, divided into 200,000 shares of $10 each; 100,001 shares are owned by the Leadville Mining Co. A dispatch from the Superintendent of the Company says: "A large body of ore has been struck in the incline of the Shamrock." Fifty thousand shares of the stock of this company were placed on the market and promptly taken at $1.10 per share.

The Dunderberg ore sold in April yielded a little over 20,000 ounces of silver, and there was about $4000 worth of ore that was not sold, making the total product about $25,000. The first-class ore ran 815 ounces; second-class, 340 ounces; and third-class, 150 ounces. A large amount of dead-work is being done, and it is hoped to largely increase the production soon. Just east of the most easterly workings of the Dunderberg, ore has been obtained in making developments near the surface, which gave a mill return of 6600 ounces per ton.

Although we have very frequently advised our readers to avoid subscribing to the capital stock of companies that do not give disinterested, unquestioned expert evidence of the value of properties offered, yet we continually learn of investments being made entirely upon the reports of those interested, and sometimes of entire strangers. No mine should be offered the public without a full report by some well-known, competent, reliable, and disinterested expert, and it is safe to say that, in the cases of properties for which $100,000 or more is asked, the sellers fear that such a report would be an injury rather than a benefit to them in making a sale.

We hear of a good many large properties that are to be offered. Did the owners believe that they are worth all that is asked for them, they would furnish the public with full information; for the saving in the cost of floating the stock would be several fold greater than an expert's fee; and we can assure our readers that mine owners know the value of a thousand dollars as well as other men. Some investors invest on the recommendation of bankers who know nothing of mining and who undertake to float a mine upon entirely interested information. No banking house of standing can afford to offer to the public a mine that has not the indorsement of a first-class disinterested expert. When such is employed, either at the expense of the banker or owner (and there are plenty who will make the same report for either), the banker can take his true position, and should the mine prove unsuccessful, his patrons, knowing that he has taken all business precautions, will transfer the blame from him to the expert. Some bankers who neglect this advice will certainly regret it in time. There are plenty of good mines in which to invest, and there will be plenty more, so that investors should make careful selections.

Already it is found that it will be possible to do a legitimate mining-stock business in San Francisco under the new Constitution, and that it is not nearly so oppressive as was stated previous to the election. It will, however, be, to a great extent, the excuse for bringing San Francisco mines to this market.

We are advised from Boston that the mercantile agencies have notified merchants and others that, if they deal in mining stocks, they will be rated down. We have always supposed that these agencies endeavored to rate men and firms according to their actual financial condition. There are plenty of dealers in mining stocks who carry "A 1's" as strongly as dealers in other securities. A man may deal in mining stocks and accumulate a large fortune, and if the reports of the mercantile agencies lower his standing on account of these dealings, they will simply make their reports less valuable than they are now. We think the position of these agencies is to make correct reports, and not attempt to bulldoze merchants and others that the labor of securing reliable information may be reduced. Any merchant who will use so little judgment in making investments, as many have done and are doing, deserves to be rated as unsafe; but mining investments made with the same precautions and the employment of the same amount of judgment that men use in other business transactions, are fairly safe, and those who employ these requisites should be rated accordingly.

A letter, dated May 8d, from the Superintendent of

the Leadville Mining Co., to the officers in this city, says:

"The mine at present writing is in very much finer condition than at any previous time, either before or after its purchase by the company, and I am confident that the yield for the month of May will show a large advance on that of March and April. We shall produce over $30,000, and possibly $40,000, this month. The mine is looking superbly in second, third, and fourth levels. I have to-day five feet of first-class ore in the fourth level, one to two feet in the third level. The second level is also yielding handsomely, while the old stopes will put out enough to pay all working expense; took out yesterday fifteen tons of first-class ore; two of the latest mill-runs on this grade went over 400 ounces of silver per ton, and 50 per cent lead; for this grade I receive $370 per ton."

SAN FRANCISCO MINING STOCK QUOTATIONS.

*Daily Range of Prices for the Week.*

| NAME OF COMPANY | CLOSING QUOTATIONS | | | | | | Opening. |
|---|---|---|---|---|---|---|---|
| | May 9. | May 10. | May 12. | May 13. | May 14. | May 15. | May 16. |
| Alpha | 17 | 15¾ | 14 | 15½ | 16¼ | 16⅛ | 18¼ |
| Alta | 5½ | 5½ | 5½ | 6⅞ | 6⅝ | 6¾ | 6¾ |
| Argenta | .... | .... | .... | .... | .... | .... | .... |
| Bechtel | .... | .... | .... | .... | .... | .... | .... |
| Belcher | 4¾ | 4⅜ | 3⅜ | 5 | 4⅞ | 4⅞ | 5⅜ |
| Belle Isle | .... | .... | .... | .... | .... | .... | .... |
| Benton | .... | .... | .... | .... | .... | .... | .... |
| Best & Bel. | 14¼ | 13 | 12¼ | 13⅞ | 14¼ | 14¼ | 14¾ |
| BlackHawk | .... | .... | .... | .... | .... | .... | .... |
| Bodie | 9⅜ | 9½ | 9⅜ | 9¼ | 9¾ | 11 | .... |
| Booker | .... | .... | .... | .... | .... | .... | .... |
| Bullion | 4 | 3⅝ | 3½ | 4 | 4⅜ | 4¼ | 5 |
| Bulwer | .... | .... | .... | .... | .... | .... | .... |
| Caledonia | 1⅜ | .... | .... | ‡1¾ | .... | 2 | 2 |
| California | 7 | 7 | 6⅞ | 6⅞ | 7 | 7⅛ | §7 |
| Chollar | 5½ | 5 | 4¾ | 5¼ | 5½ | 5½ | 6¼ |
| Confidence | 11½ | .... | .... | 11⅜ | .... | 12⅜ | .... |
| Con. Imp | 1¼ | .... | .... | 1⅛ | .... | .... | 1.40 |
| Con. Pacific | 2½ | .... | .... | 2½ | 2½ | .... | 2½ |
| Con. Va | 7¼ | 7 | 7 | 7⅛ | 7¼ | 6⅞ | §7 |
| Crown P'int | 4⅛ | 4 | 3⅝ | 4 | 4½ | 4⅜ | 4½ |
| Endowm't | .... | .... | .... | .... | .... | .... | .... |
| Eureka Con | 16¾ | 16¼ | 16 | 16¼ | 16½ | 18 | .... |
| Exchequer | 4½ | 4 | 3⅞ | 4¾ | 4¾ | 4¾ | .... |
| Goodshaw | .... | .... | .... | .... | .... | .... | .... |
| Gould & Cur | 7¾ | 7⅜ | 7 | 7⅛ | 8¼ | 8 | 8¾ |
| Grand Prize | 3½ | 3¼ | 3¼ | .... | 3¼ | 3¼ | .... |
| Hale & Nor. | 10⅝ | 10½ | 10⅝ | 11 | 12½ | 12½ | 13 |
| Hamburg | .... | .... | .... | .... | .... | .... | .... |
| Homestake | .... | .... | .... | .... | .... | .... | .... |
| Hussey | .... | .... | .... | .... | .... | .... | .... |
| Indep'd'nce | .... | .... | .... | 2.80 | 3.00 | .... | 2.75 |
| Jackson | .... | .... | .... | .... | .... | .... | .... |
| Julia Con | 3⅛ | 3 | 2⅝ | 3¼ | 3⅜ | 3¼ | 3⅛ |
| Justice | 3⅛ | 3⅛ | 2⅝ | 3⅛ | 3⅜ | 3⅛ | 3¼ |
| Kentuck | *6½ | .... | .... | 3⅜ | 3¾ | 4 | 4 |
| Kossuth | .... | .... | .... | .... | .... | .... | .... |
| Leopard | .... | .... | .... | .... | .... | .... | .... |
| Leviathan | 65c. | .... | .... | 55c. | 55c | .... | 55c. |
| Manhattan | .... | .... | .... | .... | .... | .... | .... |
| McClinton | .... | .... | .... | .... | .... | .... | .... |
| MeadowVal | .... | .... | .... | .... | .... | .... | .... |
| Mexican | 29 | 29¼ | 25¼ | 30 | †32½ | 31½ | 34 |
| Mono | .... | .... | .... | .... | .... | .... | .... |
| Navajo | .... | .... | .... | .... | .... | .... | .... |
| North. Belle | 7½ | 7 | 6¾ | 6⅞ | .... | 7 | .... |
| Ophir | 33½ | 33 | 30 | 34 | 36¾ | 35¾ | 39½ |
| Orig. K'ys'e | .... | .... | .... | .... | .... | .... | .... |
| Overman | 8 | 7¼ | 6½ | 7¼ | 7¾ | 7¾ | 9 |
| P. Sheridan | .... | .... | .... | .... | .... | .... | .... |
| Potosi | 3½ | 2⅞ | 2¼ | 2⅞ | 3 | 3 | 3 |
| Ray. & Ely | 3 | 3 | 3 | 2⅞ | 3 | 3 | .... |
| Richer | .... | .... | .... | .... | .... | .... | .... |
| Savage | 9⅝ | 9 | 9 | 10 | 11 | 10¾ | 11¾ |
| Scorpion | 2⅛ | .... | .... | 2⅛ | 2⅜ | 2½ | .... |
| Seg. Belcher | *25 | .... | .... | 22 | 23 | .... | 23 |
| Sierra Nev | 44¼ | 41¾ | 39¼ | 44¾ | 44¾ | 44 | 45½ |
| Silver Hill | 1⅜ | .... | .... | .... | 1⅞ | 1⅞ | 2 10 |
| Silver King | .... | .... | .... | .... | .... | .... | .... |
| Summit | .... | .... | .... | .... | .... | .... | .... |
| Tioga | .... | .... | .... | .... | .... | .... | .... |
| Tip Top | .... | .... | .... | .... | .... | .... | .... |
| Union Con. | 65 | 59½ | 53 | 64 | 67½ | 67½ | 70 |
| Utah | 13½ | .... | .... | 13½ | 13½ | .... | 14 |
| Ward | .... | .... | .... | .... | .... | .... | .... |
| WashoeCon | .... | .... | .... | .... | .... | .... | .... |
| Wells Fargo | .... | .... | .... | .... | .... | .... | .... |
| Yel. Jacket | 13⅝ | 13 | 12 | 14 | 14⅞ | 14 | 16 |

* Opening. † Assessed $1. ‡ Opening assessment paid. § Ex-Dividend. ‖ Assessment paid.

REVIEW OF THE SAN FRANCISCO MARKET.

Contrary to general expectations, the "New Constitution" excitement does not seem to possess permanency as far as mining investments are concerned, the whole list opening to-day at enhanced rates. The list was very materially depressed for the first few days following the result of the election; but it has recovered, and a very good feeling is reported in the market. A strengthening effect is given to the list by the recent announcement of the Nevada Bank increasing its loans on the principal stocks as follows:

On Sierra Nevada, from $20 to $25; on Union, from $25 to $30; Ophir, from $10 to $15; Mexican, from $12 to $15; Gould & Curry, from $3 to $4, and Hale & Norcross, from $4 to $5.

The agreement for the joint sinking of the Foreman shaft to a depth of 4250 feet by the Crown Point, Belcher, Segregated Belcher, Overman, and Caledonia Mining Companies is a significant step in Comstock mine management, and a possible forerunner to other important combinations in the future, looking to the economical working of the developed and proven mines on the lode. The proportion of the expense to be borne by the companies sinking this shaft is stated as follows: Overman, 30 per cent; Caledonia, 25 per cent; Belcher, 26 per cent; Crown Point, 15 per cent; Seg. Belcher, 4 per cent. Total, 100 per cent. Reports from persons who have recently visited the principal mines are quite encouraging, especially about those at the north end of the lode.

Alpha opens at 18¼, against $14 on the 12th inst., and $17, as in our last.

Alta is steady at $6¾, quite an improvement on our last. The joint, three-compartment, incline winze in this mine has reached the 1750 level, and the work of chambering out the station at that point is progressing favorably. Cross-cutting will soon be commenced.

The Argenta Mining Company has leased the Grand Prize mill, and will soon commence the reduction of its ore. This stock has been quite active on the San Francisco market, at from $1.20 to $1.80 per share. It is stated that this company will be in a position to pay a dividend in June.

Belcher shows an improvement. The main incline is now down about 150 feet below the 2660 station.

Best & Belcher opens at $14¾, the best price of the week, but not quite up to the closing in our last. The Osbiston shaft averages 3 feet per day, and is now down 550 feet.

Bullion shows an improvement. Nothing of special interest from the mine.

Bechtel has been quite active in San Francisco, at from 90c. to $1.10 per share.

Belvidere, a Bodie mine, makes a very respectable showing in the dealings in the San Francisco market, at $1.75@$1.25 per share.

The drift north from the bottom of the winze on the Great Western ledge in this mine, is in 18 feet, in ore reported very rich. This is at a vertical depth of 250 feet. Some cross-cutting is going on in a westerly direction.

Black Hawk shows moderate dealings in San Francisco at $2@$2.15 per share. The winze in the north drift, 220 level, Warren ledge, in this mine, is down 24 feet in very good ore.

Bodie closed yesterday at $11, the highest price for some time past. There is not much information made public regarding the condition of this mine.

Bulwer has been fairly active in San Francisco at $11.75 per share, presumably for the new stock. This company is making very satisfactory shipments, and the mine is reported as looking well in all portions.

Caledonia has advanced to $2 per share. The flow of water in this mine is very strong. No change otherwise.

Chollar opens at $6¼, against $5¾ a week ago.

Confidence shows some improvement.

Consolidated Imperial opens at $1.40 per share, as against $1.25 last week. Very satisfactory operations are going forward in this mine.

Crown Point has also improved. The cross-cuts on the 2500 level of this mine are reported as looking well.

Consolidated Pacific mine is said to be looking well, and it is rumored that the company will begin paying dividends in July.

The old bonanzas continue their usual output, and are thereby attracting considerable attention, both on this market and in San Francisco. The California Co. is now yielding nearly 300 tons of ore per day, the April product reaching very nearly half a million of dollars. Consolidated Virginia follows with an output of scarcely 200 tons daily. The most active work is going forward in both of these mines.

Eureka Consolidated shares in the general advance, closing yesterday at $18. This mine continues to yield and look well, and the fact that the company has advertised for the delivery of 100,000 bushels of charcoal monthly is regarded as pretty positive evidence that it contemplates producing for some time to come.

Exchequer, contrary to the general tendency of the list, is lower. Work is temporarily delayed in this mine on the 2400 level, consequent on placing the new Consolidated Imperial Air Compressor.

Gould & Curry is firm, at an advance on our last quotation. The joint east drift, 1700 level, is being extended toward the perpendicular of the Osbiston shaft at the rate of five feet per day.

Grand Prize closed yesterday at a slight decline. The stock, however, has been steady at our quotations, $3¼@$3½. The water in this mine is said to be easily handled by the pump, and the new shaft is down 20 feet below the 500-foot level, the company having ample machinery to sink to 600 feet. The indications at the bottom of present workings are said to be very favorable.

Hale & Norcross shows an improvement of $2 per share on the price in our last. The water in this mine is slowly rising, and is now 124 feet above the 1900 foot station. The work of cutting out a station in this mine in the incline at the Sutro level to start a drift to the branch connecting with the Julia is making good progress.

Hamburg shows very moderate transactions in San Francisco, at 40@45c. per share. The east cross-cut on the 600 level of this mine is reported in favorable vein matter; some rich ore is being taken from near the surface of the south shaft, the old Hamburg shaft, and from just above the end of the south drift on the 250 foot level.

Hillside has sold quite freely in San Francisco, at $2.15@$2.75. The weekly output of this mine amounts to from $10,000 to $15,000. The 350-foot level, west, is still carrying ore full size of drift, with no foot-wall in sight. The east drift, 250-foot level, carries some good ore, with a very favorable outlook. The mine is still improving in the bottom.

Julia is unchanged. The recent breaking of a pump-rod has materially interfered with operations in this mine.

Justice is well maintained. Work at all points of this mine is making favorable progress. The west cross-cut, 1150 level, continues to cut seams of quartz and low-grade ore.

The Waller Defeat workings continue their usual yield. According to the President's report, which was submitted at the annual meeting of this company, held on the 5th inst., an attachment has been made upon property that will yield $105,000 toward satisfaction of a judgment which it is expected will be rendered against Schultz and Von Bargen, ex-Treasurers. The amount at the credit of expense account awaiting the result of the suit is $493,767. The Secretary's report shows the receipts during the year to have been $733,116; expenditures, $732,275, and cash on hand, $831.

Kentuck is lower. This company levied an assessment of $1 per share on the 9th inst.

Leviathan is lower. Nothing of special interest from the mine.

Martin White is moderately active in San Francisco at $5.75@$7 per share. This company is erecting another furnace, and the outlook for a good showing in bullion production in the near future is quite promising.

Mexican and Ophir show marked advances, the former opening at $34, against $29 a week ago, and the latter $39½, against $31½. The workings in the Mexican mine are in favorable vein matter, and in the Ophir a strike is reported on the 2300 level, carrying a large percentage of gold. The low grade from the bottom of the incline of this mine is being reduced at the Mexican mill.

Northern Belle is steady, and producing regularly. Every thing is working well about this mine.

Overman opens at $9, the best price of the week.

Raymond & Ely is unchanged. The company's mills are running on ore, and every thing about the mine looks promising.

Savage shows quite an advance. The water, of course, is coming up in this mine.

The new bonanzas open at the best prices of the week, and at a slight improvement on the prices recorded in our last, Sierra Nevada being quoted at $45¼ and Union Consolidated at $70. Ore is now being shipped from the bottom of the incline of the Sierra Nevada mine to the Mariposa mills. The incline is making better progress below the 2300 station than heretofore, the bottom continuing to cut a formation of hard quartz containing alternate seams of high and low grade ore. Six feet per day are being added to the length of the main north drift 2000 level of the Union Consolidated, and it is now in 245 feet from the south line. It is being run for the North Con. Virginia shaft, and has its face in hard porphyry.

Tip Top has been sparingly dealt in on the San Francisco market, at from 60c. to 80c. per share. The following, however, from a Pacific coast contemporary, would seem to warrant a better price for this stock:

"The Tip Top, Arizona, is running 120 men, and the

# GENERAL MINING STOCKS.

## Dividend Paying Mines.

| NAME AND LOCATION OF COMPANY. | | Feet on Vein. | Capital Stock. | SHARES. No. | SHARES. Par Val | ASSESSMENTS. Total levied to date. | ASSESSMENTS. Date and amount per share of last. | DIVIDENDS. Total paid to date. | DIVIDENDS. Last Dividend. | Rate p. An | HIGHEST AND LOWEST PRICES PER SHARE IN CURRENCY AT WHICH SALES WERE MADE. May 10. H. | May 10. L. | May 12. H. | May 12. L. | May 13. H. | May 13. L. | May 14. H. | May 14. L. | May 15. H. | May 15. L. | May 16. H. | May 16. L. | SALES. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alps | Nev. | 800 | | 30,000 | | 204,000 | Aug. 1878 $1 00 | 37,500 | Apr. 1876 $0 05 | | | | | | | | | | | | | |
| Belcher, c. s. | Nev. | 1,040 | 10,400,000 | 104,000 | 100 | 1,496,200 | Feb. 1879 1 00 | 15,397,200 | Apr. 1876 1 00 | | | | | | | | | | | | | |
| Bobtail, c | Col. | 2,500 | 1,136,630 | 227,326 | 5 | * | | 90,930 | Nov. 1878 15 | | | | | | | | | | | | | |
| Bobtail Tunnel, c | Col. | | 100,000 | 20,000 | 5 | 52,000 | July 1873 0 30 | 36,000 | Dec. 1878 40 | | | | | | | | | | | | | |
| Bodie, c | Cal. | | 5,000,000 | 50,000 | 100 | 75,000 | May. 1879 1 00 | 800,000 | Jan. 1879 1 00 | | | | | | | | | | | | | |
| California, c. s. | Nev. | 600 | 54,000,000 | 540,000 | 100 | | | 30,510,000 | May. 1879 50 | | 7⅞ | 7¼ | | | 7⅞ | 7 | 7½ | | 7½ | 7¼ | 7 | 6⅞ | 1,315 |
| Calumet & Hecla, c | Mich | | 2,000,000 | 80,000 | 25 | 1,200,000 | | 13,850,000 | Feb.. 1879 5 00 | | 179 | | 179½ | | 179¾ | 179½ | 179 | | | | | 56 |
| Central, c | Mich | | 500,000 | 20,000 | 25 | 100,000 | June 1862 0 65 | 1,340,000 | Feb. 1879 4 00 | | | | | | | | | | | | | |
| Chollar, c. s. | Nev. | 700 | 11,100,000 | 112,000 | 100 | 1,750,000 | Sept. 1878 5 00 | 3,040,000 | Feb. 1872 1 00 | | | | | | | | | | | | | |
| Copper Falls, c | Mich | | 1,000,000 | 20,000 | 50 | 535,000 | May. 1876 | 100,000 | Nov. 1871 1 00 | | | | | | | | | | | | | |
| Cons. Virginia, c. s. | Nev. | 710 | 54,000,000 | 540,000 | 100 | 474,600 | June 1873 3 00 | 41,040,000 | May. 1879 50 | | 8 | 7½ | 7¾ | 7¼ | 7½ | 7¼ | 7¾ | 7⅜ | 7¾ | 7 | 7⅜ | 7¼ | 8,395 |
| Confidence, c. s. | Nev. | 130 | 2,496,000 | 24,960 | 100 | 256,320 | Apr. 1878 0 50 | 78,000 | May. 1865 8⅓ | | | | | | | | | | | | | |
| Cons. Her. & Roe | Col. | 16,500 | 1,000,000 | 100,000 | 10 | * | | | | | | | | | | | | | | | | |
| Crown Point, c. s. | Nev. | 600 | 10,000,000 | 100,000 | 100 | 1,973,370 | Dec.. 1878 1 00 | 11,588,000 | Jan.. 1875 2 00 | | 4.50 | | | | | | 4.60 | 4.50 | 4.75 | 4.70 | 4.80 | 4.75 | 1,310 |
| Daney | Nev. | 2,000 | | 108,000 | | 91,800 | Nov. 1878 0 20 | 56,000 | July 1863 | | | | | | | | | | | | | |
| Eureka Cons., c. s. l. | Nev. | | 5,000,000 | 50,000 | 100 | 100,000 | May. 1876 1 00 | 3,650,000 | Apr.. 1879 1 00 | | | | | | | | | | | | | |
| Eureka G. Mg., c | Cal. | 1,680 | 2,000,000 | 20,000 | 100 | | | 2,149,000 | Apr. 1878 0 25 | | | | | | | | | | | | | |
| Findley, c | Geo. | | 200,000 | 200,000 | 1 | | | 6,000 | Apr . 1879 | | 60c | | 60c | | 58c | 56c | 58c | 57c | 57c | 55c | 58c | 56c | 10800 |
| Franklin, c | Mich | | 500,000 | 20,000 | 25 | 360,000 | June 1876 5 00 | 585,000 | Nov. 1871 1 00 | | | | | | 7½ | | | | | | | 200 |
| Gila | Ariz | | | 100,000 | | 70,000 | Jan . 1879 0 25 | 50,000 | Aug. 1875 0 25 | | | | | | | | | | | | | |
| Gould &Curry, c. s. | Nev. | 612 | 10,800,000 | 108,000 | 100 | 2,936,000 | Mar. 1879 1 00 | 3,826,800 | Oct. 1870 10 00 | | | | | | | | | | | | | |
| Grand Prize | Nev. | 1,500 | | 100,000 | | 100,000 | July. 1878 1 00 | 400,000 | Feb. 1878 1 00 | | | | | | 3.50 | | 3.50 | | | | | 160 |
| Hale & Norcross, c. s. | Nev. | 400 | 11,200,000 | 112,000 | 100 | 3,682,000 | Mar. 1879 1 00 | 1,598,000 | Apr. 1871 5 00 | | | | | | | | | | | | | |
| Homestake, c | Dak | | 10,000,000 | 100,000 | 100 | | | 150,000 | May. 1879 30 | | 35 | 34½ | | | 35 | 34⅞ | 35 | | | | 25 | 34⅜ | 1,973 |
| Hukill, c. s. | Col. | 3,288 | 1,000,000 | 100,000 | 10 | * | | | Dec. 1878 0 10 | | | | | | | | 2.65 | 2.55 | 2.65 | | | | 400 |
| Independence | Nev. | 1,500 | | 100,000 | | 75,000 | Feb.. 1878 15 | 150,000 | Nov. 1878 25 | | 3 | 2.90 | | | | | 2.70 | | | | | | 625 |
| Kentuck, c. s. | Nev. | 95 | 3,000,000 | 30,000 | 100 | 300,000 | Aug. 1878 1 00 | 1,252,000 | Mar. 1870 5 00 | | | | | | | | | | | | | |
| K. K. Cons. | Nev. | | | 50,000 | | 300,000 | Jan.. 1879 1 00 | 50,000 | Sept. 1873 0 25 | | | | | | | | | | | | | |
| Leadville | Col. | | 2,000,000 | | | * | | 40,000 | May. 1879 10 | | 3.50 | 3.30 | 3.55 | 3.35 | 3.55 | 3.35 | 3.50 | 3.35 | 3.65 | 3.45 | 3.90 | 3.60 | 21070 |
| Leeds | Uth | 3,000 | | 60,000 | | | | 78,000 | Oct.. 1878 0 15 | | | | | | | | | | 80c | | | 80c | 375 |
| Leopard, L. c. s. | Nev. | 1,500 | 5,000,000 | 50,000 | 100 | 225,000 | Mar . 1879 50 | 162,500 | Dec. 1876 0 50 | | | | | | | | | | | | 1 | 160 |
| Manhattan | Nev. | | | 50,000 | | 50,000 | Oct.. 1878 1 00 | 400,000 | Feb. 1877 1 00 | | | | | | | | | | | | | |
| Merrimac, s | Mas. | 1,500 | 500,000 | 100,000 | 5 | * | June | 120,000 | Mar. | | | | | | | | | | | | | |
| Minesota, c | Mich. | | 1,000,000 | 20,000 | 50 | 436,000 | 1869 1 00 | 1,820,000 | Mar. 1876 0 50 | | | | | | | | | | | | | |
| Modoc | Cal. | 4,000 | | 100,000 | | 450,000 | Feb.. 1879 0 50 | 50,000 | Dec. 1876 0 50 | | | | | | | | | | | | | |
| Moose | Col. | 39,000 | 2,000,000 | 200,000 | 10 | * | | 550,000 | Mar. 1878 0 25 | | 3.75 | 3.50 | 3.30 | 3.25 | 3.35 | 3 | 3.05 | 2.95 | 3.10 | 3 | 3.05 | 3 | 10100 |
| National, c | Mich. | | 500,000 | 20,000 | 25 | 195,000 | Oct.. 1875 1 00 | 360,000 | Oct. 1873 1 00 | | | | | | | | | | | | | |
| N. Y. & Colorado, c | Col. | | 1,000,000 | 50,000 | 20 | * | | 20,000 | Mar. 1877 0 20 | | | | | | | | | | | | | |
| Northern Belle, s | Nev. | 1,600 | 5,000,000 | 50,000 | 100 | | | 1,425,000 | Feb. 1878 1 00 | | | | | | | | | | | | | |
| Ontario | Uth. | 3,000 | 10,000,000 | 100,000 | 100 | | | 2,100,000 | Apr. 1879 50 | | | | 39 | | | | | | | | 39 | 38½ | 225 |
| Ophir, c. s. | Nev. | 675 | 10,080,000 | 100,800 | 100 | 3,436,800 | Nov. 1878 1 00 | 1,394,400 | Mar. 1864 4 00 | | | | | | | | | | | | | |
| Osceola, c | Mich. | | 1,000,000 | 40,000 | 25 | 880,000 | Nov. 1877 3 00 | | Nov. 1878 1 00 | | | | | | | | | | | | | |
| Pewable, c | Mich. | | 500,000 | 20,000 | 25 | 185,000 | June 1868 3 00 | 400,000 | July 1873 1 00 | | | | | | | | | | | | | |
| Potosi, s | Nev | 700 | 11,000,000 | 112,000 | 100 | | | $ | | | | | | | | | | | | | | |
| Phœnix, c | Mich. | | 1,000,000 | 20,000 | 50 | 817,500 | Sept. 1870 3 00 | 10,000 | Dec. 1876 1 00 | | | | | | | | | | | | | |
| Plumas | Cal. | | 1,000,000 | 100,000 | 10 | | | 138,000 | May. 1879 8 | | 3.65 | 3.60 | 3.55 | | | | | | 3.55 | 3 35 | 3.60 | 3.50 | 1,05 |
| Quincy, c | Mich. | | 200,000 | 20,000 | 10 | | | 2,250,000 | Feb. 1878 5 00 | | | | | | | | 14 | | | | | 10 |
| Raymond & Ely, c. s. | Nev. | 5,000 | 3,000,000 | 30,000 | 100 | 800,000 | Apr.. 1879 1 00 | 3,075,000 | Sept. 1873 3 00 | | | | | | | | | | | | | |
| Ridge, c | Mich. | | 500,000 | 20,000 | 25 | 200,000 | | 90,000 | Feb. 1875 1 00 | | 1¾ | | 1¾ | | | | | | | | | 275 |
| Rye Patch | Nev. | 1,600 | | 30,000 | | 157,500 | Dec.. 1878 1 00 | 105,000 | Dec. 1877 0 25 | | | | | | | | | | | | | |
| St. Joseph, L | Mo. | 2,000 acs. | 1,000,000 | 100,000 | 10 | | | 250,000 | | | | | | | | | | | | | | |
| Savage, c. s. | Nev. | 800 | 11,200,000 | 112,000 | 100 | 4,196,500 | Feb. 1879 1 00 | 4,460,000 | June 1869 3 00 | | | | | | | | | | | | | |
| Seaton, c. s. | Col. | 1,700 | 500,000 | 50,000 | 10 | * | | | May 1877 0 10 | | | | | | | | | | | | | |
| Sierra Nevada, c. s. | Nev. | 3,650 | 10,000,000 | 100,000 | 100 | 2,550,000 | Apr.. 1879 2 00 | 102,000 | Jan. 1871 1 00 | | | | | | | | | | | | | |
| Silver Islet | Mich | | | | | | | | | | 60 | 54½ | 55 | 54 | 53 | 52 | | | | | | | 1,606 |
| Silver King | Ariz | 1 500 | 10,000,000 | 100,000 | 100 | | | 450,000 | Nov 1878 0 50 | | | | | | | | | | | | | |
| Standard | Cal. | | 10,000,000 | 100,000 | 100 | 50,000 | July 1878 1 00 | 1,000,000 | Apr. 1879 0 50 | | 30½ | 29½ | 30 | 29¼ | 30½ | 29 | 29½ | 29 | 29½ | 29½ | 29½ | 28¾ | 3,765 |
| Yellow Jacket, c. s. | Nev. | 1,200 | 12,000,000 | 120,000 | 100 | 4,038,000 | Apr.. 1879 1 00 | 2,184,000 | Aug. 1871 2 50 | | 13¾ | | | | | | | | | | | 50 |
| McClinton | Cal. | 1,000 | | 60,000 | | 45,000 | Dec.. 1878 0 25 | | | | | | | | | | | | | | | |

## Non-Dividend Mines.

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Allouez, c | Mich. | | 1,000,000 | 20,000 | 50 | 940,000 | May 1876 5 00 | | | | | | | | | | | | | | | | | |
| Alpha, c. s. | Nev. | 306 | 3,000,000 | 30,000 | 100 | 240,000 | Mar . 1878 1 00 | | | | | | | | | | | | | | | | | |
| Alta | Nev. | 600 | | 108,000 | | 1,101,000 | Feb. 1879 1 00 | | | | | | | | | | | | | | | | | |
| Am. Flag, c | Col. | 5,300 | 600,000 | 60,000 | 10 | * | | | | | | | | | | | | | | | | | | |
| Andes | Nev. | 2,000 | | 100,000 | | 355,000 | Oct 1878 0 25 | | | | | | | | | | | | | | | | | |
| Baltimore Cons | Nev. | 1,050 | | 84,000 | | 1,015,000 | Apr. 1878 0 50 | | | | | | | | | | | | | | | | | |
| Benton | Nev. | 600 | | 108,000 | | 91,800 | Dec. 1878 0 50 | | | | | | | | | | | | | | | | | |
| Bechtel | Cal. | | | 60,000 | | 96,000 | Apr.. 1879 0 25 | | | | | | | | | | | | | | | | | 1.0 |
| Bertha & Edith, c | Vir. | 645 acs. | 500,000 | 500,000 | 10 | * | | | | | 42c | 38c | 50c | 44c | 40c | | 36c | 37c | 34c | 38c | 35c | 37c | 35c | 74,492 |
| Best & Belcher, c. s. | Nev. | 545 | 10,080,000 | 100,800 | 100 | 639,390 | Apr.. 1879 1 00 | | | | | | | | | | | | | | | | | |
| Boyle | Nev. | 600 | | 108,000 | | 16,240 | Aug. 1878 0 15 | | | | | | | | | | | | | | | | | |
| Buckeye | Col. | | 2,000,000 | 400,000 | 5 | * | | | | | 63c | 57c | 62c | 54c | 59c | | 55c | 59c | 55c | 55c | | 62c | 54c | 105,700 |
| Bullion, c. s. | Nev. | 943½ | 10,000,000 | 100,000 | 100 | 3,002,000 | Dec. 1878 1 00 | | | | | | | | | | | | | | | | | |
| Caledonia, c. s. | Nev. | 2,188 | 10,000,000 | 100,000 | 100 | 1,640,000 | Apr. 1879 0 50 | | | | | | | | | | | | | | | | | |
| Cashier | Col. | | 500,000 | 250,000 | 2 | * | | | | | | | | | | | | | | | | | | |
| Challenge | Nev. | 90 | | 5 ,000 | | 10,000 | Nov. 1878 0 20 | | | | | | | | | | | | | | | | | |
| Cleveland, c | Col. | 3,715 | 250,000 | 25,000 | 10 | * | | | | | 2.55 | 2.25 | 2.65 | 2.45 | 2.75 | 2.65 | 2.80 | 2.75 | 2.80 | 2.75 | 2.75 | | 9,850 |
| Cons. Imperial, c. s. | Nev. | 468 | 50,000,000 | 500,000 | 100 | 875,000 | Feb.. 1879 0 20 | | | | 1.40 | | | | 1.10 | | 1.30 | 1.25 | 1.40 | 1.35 | 1.50 | 1.40 | 2,760 |
| Con. N. Slope & E. T.C. | Col. | 15,000 | 500,000 | 10,000 | 50 | * | | | | | | | | | | | | | | | | | | |
| Con. Pacific | Cal. | 1,400 | | 60,000 | | | | | | | | | 3.50 | 3.25 | | | | | 3.50 | | | | 630 |
| Dahlonega | Ga. | | 250,000 | 250,000 | 1 | * | | | | | 27c | 25c | 27c | 25c | 27c | 25c | 26c | 25c | 26c | 25c | 28c | 25c | 27,940 |
| Dana, c | Mich. | | 500,000 | 20,000 | 25 | 68,000 | Jan.. 1863 0 50 | | | | | | | | | | | | | | | | | |
| Dawson, s | Ont. | | 1,200,000 | 60,000 | 20 | | 1878 | | | | | | | | | | | | | | | | | |
| Day | Nev. | 1,500 | | 100,000 | | 70,000 | Feb.. 1879 0 15 | | | | | | | | | | | | | | | | | |
| Dayton | Nev. | 1,600 | | 100,000 | | 75,000 | Apr. 1878 0 25 | | | | | | | | | | | | | | | | | |
| De Frees | Ariz | 1,500 | | 100,000 | | 115,000 | Oct.. 1878 15 | | | | | | | | | | | | | | | | | |
| Duncan, s | Ont. | | 1,200,000 | 60,000 | 20 | 70,000 | July 1876 41⅔ | | | | 4¾ | | 4⅝ | 4¾ | | | | | | | | | 325 |
| Exchequer, c. s. | Nev. | 400 | 10,000,000 | 100,000 | 100 | 480,000 | Feb.. 1879 1 00 | | | | | | | | | | | | | | | | | |
| Gold Placer, c | Col. | | 5,000,000 | 200,000 | 25 | | | | | | 29c | 26c | 27c | 26c | 26c | 25c | 26c | 25c | 26c | | 26c | | 12,400 |
| Granville, c | N. C. | 357 acs. | 1,000,000 | 100,000 | 10 | * | | | | | | | | | | | 20c | | 20c | | 23c | 20c | 2,000 |
| Humboldt, c | Mich. | | 500,000 | 20,000 | 25 | 100,000 | Sept 1878 0 15 | | | | | | | | | | | | | | | | | |
| Hussey | Nev. | 1,500 | | 100,000 | | 110,000 | Jan.. 1879 0 15 | | | | | | | | | | | | | | | | | |
| International, s | Ont. | | 1,200,000 | 60,000 | 20 | | | | | | | | 75c | | | | | | | | 11c | | 100 |
| Julia, c. s. | Nev. | 3,000 | 11,000,000 | 110,000 | 100 | 872,500 | Jan . 1879 1 25 | | | | | | | | | | 3⅝ | | | | | | 150 |
| Justice, c. s. | Nev. | 2,100 | 10,500,000 | 105,000 | 100 | 2,763,500 | Jan.. 1879 1 00 | | | | | | | | | | | | | | | | 10 |
| King's Mountain, c | N. C. | | 1,200,000 | 120,000 | 10 | * | | | | | | | | | | | | | | | | | | |
| Kossuth | Nev. | 2,700 | | 108,000 | | 421,200 | Aug. 1877 0 15 | | | | | | | | | | | | | | | | | |
| Lacrosse | Col. | 3,900 | 1,000,000 | 100,000 | 10 | * | | | | | 30c | 29c | 30c | 29c | 29c | 28c | 30c | | | | 30c | | 9,000 |
| Leviathan | Nev. | 2,000 | | 100,000 | | 265,000 | Mar. 1879 25 | | | | | | | | | | | | | | 55c | 50c | 400 |
| Luzerne | Col. | 4,200 | 5,000,000 | 500,000 | 10 | * | | | | | | | | | | | | | | | | | | |
| Madison, c | Mich. | | 500,000 | 20,000 | 25 | 123,000 | Sept 1876 0 10 | | | | | | | | | | | | | | | | | |
| Mariposa preferred | Cal. | 44,387 | 5,000,000 | 50,000 | 100 | 1,125,000 | June 1877 1 00 | | | | 7¾ | 7 | | | | | | | | | 7 | | 500 |
| " common | Cal. | acres. | 10,000,000 | 100,000 | 100 | 1,425,000 | June 1878 1 00 | | | | 7 | | 7 | 6½ | 7 | | 8 | | 7¼ | 7⅛ | 7 | 6½ | 1,500 |
| McCracken | Ariz | 4,500 | | 100,000 | | 100,000 | Oct.. 1878 0 50 | | | | | | | | | | | | | | | | | |
| Martin White | Nev. | | | 100,000 | | 65,000 | Dec. 1878 1 50 | | | | | | | | | | | | | | | | | |
| Mesnard, c | Mich. | | 500,000 | 20,000 | 25 | 100,000 | Apr. 1876 0 50 | | | | | | | | | | | | | | | | | |
| Mexican, c. s. | Nev. | 600 | 10,080,000 | 100,800 | 100 | 217,400 | May. 1878 0 50 | | | | | | | | 28 | | 30 | 28 | | | | | 10 |
| Minnietta Belle | Cal. | 1,500 | | 100,000 | | 75,000 | Apr. 1878 0 50 | | | | | | | | | | | | | | | | | |
| Mt. Bross Tunnel | Col. | 8,600 | 2,000,000 | 200,000 | 10 | * | 1878 | | | | | | | | | | | | | | | | | |
| Navajo | Nev. | 1,500 | | 100,000 | | 145,000 | Feb.. 1879 0 20 | | | | | | | | | | | | | | | | | |
| New York | Nev. | 1,500 | | 100,000 | | 80,000 | Feb.. 1879 0 40 | | | | | | | | | | | | | | | | | |
| Occidental | Nev. | 1,700 | | 40,000 | | 72,500 | Feb. 1877 0 25 | | | | | | | | | | | | | | | | | |
| Orig. Keystone | Nev. | 1,500 | 1,000,000 | 100,000 | 10 | 100,000 | Apr. 1879 0 50 | | | | | | | | | | | | | | | | | |
| Overman, c. s. | Nev. | 1,200 | 3,840,000 | 38,400 | 100 | 3,401,280 | Jan.. 1879 3 00 | | | | | | | | | | | | | | | | | |
| Petherick, c | Mich. | | 500,000 | 20,000 | 100 | 265,533 | Mar. 1876 0 50 | | | | | | | | | | | | | | | | | |
| Pleasant View, c | Col. | 1,200 | 200,000 | 20,000 | 10 | * | | | | | | | | | | | | | | | | | | |
| Quicksilver preferred | Cal. | 8,500 | 4,291,300 | 42,913 | 100 | * | | | | | 44½ | 42 | 46 | 44½ | 43¾ | 41 | 42¼ | 43¾ | 42 | 43¾ | 42 | | 6,888 |
| " common | Cal. | acres. | 5,708,700 | 57,087 | 100 | * | | | | | 14½ | 14 | 15 | 13⅝ | 14⅛ | 14 | 14½ | 14¾ | 14½ | | | | 2,500 |
| Rockland, c | Mich | | 500,000 | 20,000 | 25 | 495,000 | Jan.. 1874 1 00 | | | | | | | | | | | | | | | | | |
| Seg. Belcher, c. s. | Nev. | 160 | 640,000 | 6,400 | 100 | 244,800 | Apr. 1876 5 00 | | | | | | | | | | | | | | | | | |
| Silver Hill, c. s. | Nev. | 5,400 | 10,800,000 | 108,000 | 100 | 1,404,000 | Apr. 1879 0 50 | | | | | | | | | | 1.50 | | 2 | | | | 200 |
| Silver Prize | Nev. | 1,500 | | 100,000 | | 65,000 | Feb 1879 0 25 | | | | | | | | | | | | | | | | | |
| Star, c | Mich. | | 500,000 | 20,000 | 25 | 265,000 | Mar 1876 0 50 | | | | | | | | | | | | | | | | | |
| Superior, c | Mich. | | 500,000 | 20,000 | 25 | 340,000 | Mar 1878 0 25 | | | | | | | | | | | | | | | | | |
| Sutro Tunnel | Nev. | | 20,000,000 | 2,000,000 | 10 | | | | 0 50 | | 4¾ | 4⅝ | 4¾ | 4⅝ | 4¾ | 4½ | 4¾ | 4⅝ | 4¾ | 4⅝ | 4⅝ | | 10,300 |
| Tiptop | Ariz | | | 100,000 | | 120,000 | July 1878 | | | | | | | | | | | | | | | | | |
| Tioga | Cal. | 1,500 | | 100,000 | | 80,000 | Apr. 1879 0 20 | | | | | | | | | | | | | | | | | |
| Trio | Col. | 1,250 | 150,000 | 150,000 | 1 | | | | | | | | 63c | | | | 63c | | 62c | 55c | 63c | | 2,000 |
| Trojan | Nev. | 1,500 | | 100,000 | | 265,000 | Apr. 1879 0 25 | | | | | | | | | | | | | | | | | |
| Tuscarora | Nev. | | | 100,000 | | 25,000 | Mar. 1879 0 05 | | | | | | 16c | | 15c | 14c | | | | | | | 2,100 |
| Union Cons. c. s. | Nev. | | 10,000,000 | 100,000 | 100 | 460,000 | Apr.. 1879 1 50 | | | | | | | | | | | | | | | | | |
| Utah | Nev. | 1,000 | | 20,000 | | 830,000 | Apr. 1879 2 50 | | | | | | | | | | | | | | | | | |
| Ward | Nev | 1,200 | | 110,000 | | 99,000 | Jan.. 1879 0 30 | | | | | | | | | | | | | | | | | |
| Wells Fargo | Nev. | 1 500 | | 108,000 | | 243,000 | Apr.. 1879 0 50 | | | | | | | | | | | | | | | | | |

Total Assessment levied to date..... $65,873,613

c. Gold. s. Silver. l. Lead. c. Copper. * Non-Assessable.

Total Dividends paid to date..... $154,517,330

Total Shares sold during the week..... 345,253.

number is to be increased to 140. The mine has been shipping bullion for the past six months or more at the rate of about $40,000 per month, but notwithstanding this the shareholders have not received a cent. A movement is going on here to unite the stock held in the East for the purpose of securing a change in the management of the property, which is regarded, both in Arizona, where about half the stock is held, and the East, as rather peculiar."

Utah has improved. The main incline in this mine is 472 on the slope below the 1350 level. The ground is hard, and water coming in.

Yellow Jacket opens at a marked advance, with its assessment paid. The new shaft is now down about 2500 feet; it will be used to work all the mines from the Yellow Jacket to the Potosi.

The *Commercial Herald* of the 9th inst. says of the market:

"Under the favorable reports from the north end mines on the Comstock lode, the mining share market picked up increased animation, resulting in larger business and well maintained, if not increased, prices. Stocks are well held, and it seems evident that only those who are unable to hold realize at this time, for it was conceded on every hand, just preceding the election, that we might look for an improved market if the new Constitution was defeated. The unfavorable influence this adoption will have on all interests in the State, is likely to dissipate all hope of a favorable market in the near future, and the result will be more unsatisfactory to a large class of dealers, adding still greater gains to the inside operators, who will now be more exacting than ever. We confidently believe that the result of the Sutro Tunnel drain will bring prices generally to a high figure, both by a speculative movement in advance, as well as by actual revelations afterward, in its successful performance."

*The Green Mountain Mining Company of California* has declared a dividend of 6c. per share.

ASSESSMENTS, with dates when delinquent: Lady Bryan, 50c., June 2d; Gila, 20c., June 3d; Andes, 25c., June 11th; Mount Rose, 5c., June 7th; Bullion, $1, June 9th.

### Gas Stocks.

NEW YORK, Friday Evening, May 16, 1879.

New York stocks are steady, and Brooklyn lower in consequence of the new gas company about building works, the "Fulton Municipal."

*The Electric Light too Costly Abroad.*—LONDON, May 9.—The Metropolitan Board of Works, after the recent experiment on the Thames embankment, find that electricity costs 2¼ pence (4½ cents) an hour per lamp more than the best gas giving equal light. The report declares that the defects connected with electric lighting must prevent its general adoption.

*The State Legislature on the Electric Light.*—ALBANY, May 14.—In the Assembly to-day the bill to authorize gas-light companies to use electricity for lighting purposes was ordered to a third reading.

*The Allegheny (Pa.) Gas Co.* has declared a dividend of $1 per share.

*The Mutual Gas Co.* will hold its annual meeting May 20 th.

*Cumberland, Md.*, paid $2630.67 for street lighting for the year ending May 31st, 1879.

The following list of Companies in New York and vicinity is corrected weekly by GEORGE H. PRENTISS, Broker and Dealer in Gas Stocks, No. 30 Broad street, New York:

| COMPANIES IN NEW YORK AND VICINITY. | Capital Stock. | Par. | DIVIDENDS. Rate per ann. | DIVIDENDS. Am. of last. | DIVIDENDS. Date of last. | QUOTATIONS Bid. | QUOTATIONS Ask'd. |
|---|---|---|---|---|---|---|---|
| | $ | | P. ct. | | | | |
| Mutual, N. Y. | 5,000,000 | $100 | 6 | 1½ | Apr., '79 | 70 | 75 |
| " Bonds | 90,000 | 1,000 | 6 | 3½ | Feb., '79 | 99 | 102 |
| N. York " | 4,000,000 | ..... | 8 | 4 | May, '79 | 94 | 101 |
| Metrop. " | 2,500,000 | 100 | 10 | 5 | Feb., '79 | 120 | 125 |
| " Certfs. | 1,000,000 | ..... | 7 | 3½ | Feb., '79 | 100 | 102 |
| Harlem " | 1,850,000 | 50 | 6 | 3 | Feb., '78 | 40 | 50 |
| Manhat. " | 4,000,000 | 50 | ....‡ | 5 | Feb., '79 | 180 | 185 |
| Brooklyn, Bkln. | 2,000,000 | 50 | 15 | 5 | May, '79 | 130 | 136 |
| Nassau | 1,000,000 | 25 | ....‡ | 3 | Jan., '79 | 65 | 70 |
| " Certfs. | 700,000 | 1,000 | 7 | 3½ | May, '79 | 87 | 91 |
| People's | 1,000,000 | 10 | ....‡ | 3½ | Jan., '76 | 20 | 23 |
| " Certfs. | 300,000 | 1,000 | 7 | 3½ | Jan., '79 | 70 | 75 |
| " Bonds | 325,000 | ..... | 7 | 3½ | May, '79 | 90 | 96½ |
| Metrop. " | 1,000,000 | 100 | 5 | 2½ | Nov., '78 | 57½ | 61 |
| W'msb'g " | 1,000,000 | 50 | 8 | 1½ | Apr., '79 | 80 | 90 |
| " Certfs. | 1,000,000 | ..... | 7 | 3½ | Jan., '79 | 90 | 95 |
| Citizens' | 1,200,000 | 20 | ....‡ | 3 | Jan., '79 | 75 | 80 |
| " Bonds | 315,000 | 1,000 | ..... | 3½ | Apr., '79 | 90 | 100 |
| J. C., N. J. | 750,000 | 20 | 10 | 7½ | Jan., '79 | 135 | 142 |
| Municipal, N. Y. | 2,000,000 | 100 | ..... | 3 | Feb., '79 | 115 | 120 |
| " Bonds | 750,000 | 100 | ..... | 3 | Feb., '7 | 95 | ... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ... |

### Copper and Silver Stocks.

Reported by WILSON W. FAY & Co., Brokers in Mining and Miscellaneous Stocks, Room 7, Traveller Building, 31 State street.

BOSTON, Thursday Evening, May 15, 1879.

The market continues active, with prices steady in the main and showing signs of strength in the large coppers. The silvers are the only weak-appearing stocks at the close, Silver Islet having dropped off 5 per cent; and probably the others to some extent have been affected by the drop.

Calumet & Hecla advanced again to 179¼, and fell off to 179; and closes firm at 179¼@179½.

Copper Falls is quiet and unchanged to any extent, 25c. being bid for stock upon which the assessment remains unpaid; and offered at 1¾, assessment paid.

Central is offered at 26, and no bid.

Franklin is quite strong, at 7½@8, with sales at 7⅝ and 7½.

Minnesota is stirring up somewhat, and is quite firm at 15-16@1 1-16.

Osceola is firm, having sold at 15⅛, and closes at 15¼ @16.

Pewabic, as we predicted, has had an assessment of $2 per share levied upon it, and closes weak at 25@50c.

Quincy is quite strong, small lots having sold up to $14, and large lots being taken at 13¾; and closes firm at 13¾ @14¼.

## COAL STOCKS.

| NAME OF COMPANY. | Capital Stock. | SHARES. No. | SHARES. Par Val. | Last Dividend. Mo. | Last Dividend. Y. | Last Dividend. A't. | Rate per Ann. | Quotations of New York stocks are based on the equivalent of $100. Philadelphia prices are quoted, so much per share. May 10. H. | May 10. L. | May 12. H. | May 12. L. | May 13. H. | May 13. L. | May 14. H. | May 14. L. | May 15. H. | May 15. L. | May 16. H. | May 16. L. | SALES. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | * | | $ | | | | Per c'nt | | | | | | | | | | | | | |
| Consol. Coal. | 10,250,000 | 102,500 | 100 | Jan. | '77 | 2½ | ... | | | | | | | | | | | | | |
| Del. & H. C. | 20,000,000 | 200,000 | 100 | Aug | '76 | 4 | 8 | 47½ | 47⅜ | 47⅛ | 47 | 47½ | 47 | 48⅛ | 47¾ | 48⅛ | 47¼ | 47⅛ | 47 | 8,532 |
| D., L. & W. RR. | 26,000,000 | 520,000 | 50 | July | '76 | 2½ | 5 | 54⅜ | 53¾ | 54½ | 53¼ | 55 | 53¾ | 56¾ | 54⅛ | 57 | 55⅜ | 55⅛ | 55 | 93,929 |
| Lehigh C. & N. | 10,148,350 | 208,971 | 50 | Nov | '76 | 1½ | 5½ | 18½ | 18¼ | 19⅛ | 18¼ | 21 | 20 | 21 | 20½ | 20⅜ | 20 | 21⅛ | 21¼ | 17,621 |
| Leh. V'y R. R. | 27,228,855 | 540,858 | 50 | Mch | '79 | 1 | 4 | 37 | 36⅞ | 36⅞ | 36⅜ | 36¼ | 35¾ | 36⅛ | 35⅞ | 36 | 35¼ | 36⅛ | 36⅜ | 2,839 |
| Maryl'd Coal | 4,400,000 | 44,000 | 100 | Jan. | '76 | 1½ | 1½ | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| N. J. C. R. R. | 20,600,000 | 206,000 | 100 | Apr | '76 | 2½ | 2½ | 45¼ | 44¼ | 44¾ | 43¾ | 45⅞ | 44¼ | 46 | 45¼ | 47¾ | 46¼ | 47⅛ | 46⅞ | 59,705 |
| Penn. Coal... | 5,000,000 | 100,000 | 50 | May | '78 | 3 | ... | | | | | | | | | | | | | |
| Penn. R. R... | 68,870,200 | 1,337,404 | 50 | May | '79 | 2 | 8 | 37½ | 37 | 37⅝ | 37 | 37¼ | 36⅞ | 37¾ | 37 | 37¾ | 36¾ | 37¼ | 37⅛ | 36,807 |
| Ph. & R. R. R. | 34,278,175 | 685,563 | 50 | Jan | '76 | 4½ | 10 | 17½ | 16⅞ | 17⅜ | 16⅞ | 18¼ | 17⅜ | 18¾ | 18 | 22½ | 20¾ | 21½ | 21⅜ | 100,277 |

The Delaware and Hudson Canal Co. has paid in dividends to date $38,821,104, and the Philadelphia and Reading $43,012,497 Total Sales.....318,710.

Ridge is also quite firm at 1¾@2, with sales at 1¾ and 1⅞, b. 30.

Duncan sold at 4¾, sagged off and sold at 4 9-16, and closes steady at 4½@4¾.

International is more quiet this week, the excitement in it having died out, and closes a little weak at 70@75c.

Silver Islet has fallen off to 52, and sold at that figure; again advanced to 53¾, and fell off to 51, and closes weak at 50¼@51.

Commonwealth is quiet at 45@50c.

Malachite is weak at ¼@⅛, with a sale at ⅝.

Altar is steady at 1⅛@1¾.

### Miscellaneous Stocks and Quotations.

Sales and quotations of the stocks and bonds dealt in here, at Philadelphia and Baltimore, for the week ending the 16th inst. are given in the following tables. The Philadelphia quotations will have a * affixed. The Baltimore quotations are indicated thus †.

| STOCKS. | Par Value. | High'st | Lowest | Closing | Sales: Shares. |
|---|---|---|---|---|---|
| American Coal Co. | $25 | ..... | ..... | 22 | ..... |
| St. L. I. M. & S. R. Co. | 100 | 29⅜ | 27⅜ | 28 | 22,083 |
| Spring Mt. Coal Co. | 50 | ..... | ..... | 50 | ..... |
| *Cambria Iron Co. | 50 | ..... | ..... | 67 | ..... |
| *Penn. Salt Mf'g Co. | 50 | ..... | ..... | 75 | 15 |
| *Westm'land C. Co. | 50 | ..... | ..... | 53 | 60 |
| *Buck Mt. Coal Co. | 50 | ..... | ..... | 40 | ..... |
| *Schuyl. Nav. Co. | 50 | ..... | ..... | ..... | ..... |
| †B. & O. R. R. Co. 1st pf | ..... | ..... | ..... | 110 | 50 |
| †B. & O. R. R. Co. 2d pf | 100 | ..... | ..... | 101 | ..... |
| " " " " com | 90 | 114 | 103 | 106 | 1,549 |
| †George's C'k C. Co | 100 | ..... | ..... | 55 | ..... |
| †S. Clara M'g Co. | 100 | ..... | ..... | 4 | ..... |
| †Atlantic Coal Co. | 10 | ..... | ..... | 76 | ..... |

| BONDS. | Princ'l. When Due. | Int'est. When Due. | Hig'st. | Lowest | Amount. |
|---|---|---|---|---|---|
| D., L. & W., 7s, conv | 1891 | J. & D. | ..... | ..... | ..... |
| " " " " 2d mtge. | 1882 | M. & S. | 105½ | 105⅛ | $7,000 |
| N. J. C., 1st mtge. new | 1890 | F. & A. | 116¾ | 116¼ | 7,000 |
| " " " 1st mtge., con | 1899 | Q. | 92¼ | 90½ | *402,000 |
| " " " convt. | 1902 | M. & N. | 93¼ | 91½ | *35,000 |
| Lehigh & W. B., con | 1899 | Q. | 58½ | 56¼ | *425,000 |
| Am. Dock & Imp. 7s | ..... | J. & J. | 70 | 68 | 5,000 |
| St. L. I. M. & S. 1st mt | 1892 | F. & A. | ..... | ..... | ..... |
| Ches. & O., 1st mtge | 1899 | M. & N. | ..... | 114 | ..... |
| D & H C Co., 1stm. rg | 1884 | J. & J. | 102 | 101¾ | 10,000 |
| " " " " " " | 1891 | J. & J. | 101½ | 101 | 4,000 |
| " " " " m. loan cp | 1894 | A. & O. | 101¾ | 101¼ | 48,000 |
| " " " " " rg. | 1894 | A. & O. | 101¼ | ..... | 14,000 |
| " " " " new mge. | ..... | ..... | ..... | ..... | ..... |
| *L. V. R., 1stm. 6s. cp. | 1898 | J. & D. | 116½ | ..... | 1,000 |
| " " " " rg. | 1898 | J. & D. | ..... | ..... | ..... |
| " " " 2d m. 7s, rg. | 1910 | M. & S. | 120 | ..... | 1,000 |
| " " " con. m. 6s, rg | 1823 | J. & D. | 107 | 105 | 79,000 |
| " " " " 6s cp. | 1923 | J. & D. | 106¾ | 106½ | 15,000 |
| *Pa. RR., 1st m. 6s, cp | 1880 | J. & J. | 105 | ..... | 19,000 |
| " " g. m., 6s, cp. | 1910 | J. & J. | 115½ | 115 | 4,000 |
| " " " 6s, rg. | 1910 | A. & O. | 115½ | ..... | 5,000 |
| " " con. m. 6s, rg. | 1905 | Q. | ..... | ..... | ..... |
| " " " 6s, cp. | 1905 | J. & D. | ..... | ..... | ..... |
| " " new loan, 5s | ..... | ..... | 112¾ | 112½ | 2,700 |
| *P. & R. R., 1st m. 6s, R. C. 43-44 | 1880 | J. & J. | 104¾ | 104⅝ | 6,000 |
| P. & R. R., 1st m. 6s, R. C. 48-49 | 1880 | J. & J. | ..... | ..... | ..... |
| P. & R. R., 2d m. 7s cp | 1893 | A. & O. | 118 | ..... | 2,000 |
| " " " scrip | 1882 | J. & J. | 70 | 65 | 24,535 |
| " " " in. m. 7s, cp | 1896 | J. & D. | 65½ | ..... | 1,000 |
| " " " c. m. 7s, cp. | 1911 | J. & D. | 112 | 111 | 7,000 |
| " " " " 7s. rg. | 1911 | J. & D. | 112 | ..... | 4,000 |
| " " " cvt. 7s, R. C | 1893 | J. & J. | ..... | ..... | ..... |
| " " C. & I. Co., Deb 7s, R. C. | 1892 | M. & S. | .... | ..... | ..... |
| " " & R. C. & I. Co., m. 7s, R. C. | '92-3 | various | ..... | ..... | ..... |
| *L. Nav. Co., 6s, rg. m. | 1884 | J. & Q. | 107 | ..... | 7,300 |
| " " RR., rg. m. | 1897 | F. & Q. | 107 | ..... | 700 |
| " " cvt. co. G. R. | 1894 | M. & S. | 98 | ..... | 2,000 |
| " " " Gold R. C. | 1897 | J. & D. | 100 | 98½ | 12,000 |
| " " con. m. 7s, rg. | 1911 | J. & D. | 87 | 84 | 11,000 |
| *P. & N. Y. C., 7s, R. C. | 1896 / 1906 | J. & D. | 120 | ..... | 2,000 |
| *Pa Canal, 6s. cp. | 1910 | J. & J. | 74 | 73 | 4,600 |
| *Schuyl. Nav., 1st m. 6s. rg | 1897 | M. & Q. | ..... | ..... | ..... |
| *Sus. Coal, 6s, rg | 1911 | J. & J. | ..... | ..... | ..... |
| †Balt. & O. RR., 6s. | 1880 | J. & J. | ..... | 102¼ | ..... |
| " " " " 6s. | 1885 | A. & O. | 107⅛ | ..... | 1,000 |

Total transactions for the week.. .....$1,168,235

* Assented.

NOTICE.—TO THE STOCKHOLDERS OF THE SCIENTIFIC PUBLISHING COMPANY: The Annual Meeting of the Stockholders of this Company for election of Trustees, and for the transaction of other business, will be held at the company's office, 27 Park Place, New York, May 28th.

HENRY M. GEER, Secretary.

### Coal Stocks.

NEW YORK, Friday Evening, May 16, 1879.

The New York market has been strong and active during the past week, and prices have been such as to give confidence to holders. Delaware, Lackawanna & Western ranged from 53¾ to 57, and closed at 55⅝, with sales of 93,929 shares; Delaware & Hudson Canal sold to the amount of 8532 shares, at from 47 to 48½, closing at 47⅜; New Jersey Central, 59,705 shares, between 43¾ and 47⅜, closing at 47¼.

The Philadelphia market, which was strong all the week, suddenly sprang into intense excitement on the announcement of the lease by the Philadelphia & Reading Railroad of the North Pennsylvania and the Bound Brook Railroads. The effect was to advance the stock from 20½ to 22½ in a few minutes, and, though the lease greatly affects the Lehigh Valley Road, by shutting off its communication with Philadelphia, should the companies become antagonistic, it advanced in sympathy. The lease of the two roads which were not a source of revenue to their stockholders, compels the lessee to pay 6 per cent for two years, 7 per cent for the next two, and 8 per cent for all subsequent years. Lehigh Navigation has been very active, with sales of 17,621 shares, the largest for a long period. The stock opened on the 10th at 18½, rose to 21 on the 13th, and closes to-night at 21¼, strong. Pennsylvania has done a moderate business within the range of 37½@36⅞, closing at 37⅛.

The *American Exchange* of to-day says: "It is announced that the Denver & Rio Grande Railway Company is about to proceed at once with the construction of three lines of new road, one from Cañon City to Leadville and 'Ten Mile,' through the Grand Cañon of the Arkansas, a distance of 150 miles,; one from Alamosa westward to the San Juan mines, a distance of 210 miles; and the third from Alamosa eastward to Albuquerque, New Mexico, a distance of 205 miles, making a total of new lines of 565 miles. To provide the $5,000,000 cash required for building these lines, the company proposes to issue first consolidated mortgage 7 per cent thirty-year gold bonds, to be a first mortgage on the new roads, and a second mortgage on the 337 miles now in operation. These bonds will be issued for the present outstanding bonds of the company, and are offered to new subscribers at 90, with a bonus of $500 stock with each $1,000 bonds. It is provided that the consolidated bonds shall not be issued at a rate exceeding $15,000 per mile. More than the whole amount of the cash required by the new lines has been already subscribed."

A dispatch from Denver yesterday says:

"In the suit between the Denver & Rio Grande and the Atchison, Topeka & Santa Fé Railroad Companies, growing out of the conflicting claims to the right of way through Arkansas Cañon, to-day, the United States Circuit Court gave the Atchison Company leave to file a supplemental bill and litigate thereby the question whether the Rio Grande Company, by lease and other contracts, admitted the right of the Atchison Company to continue its construction upon its located line. The court also held that, in any view of the case, the road-bed of a rival company could only be appropriated by payment of the cost of construction, justly computed; but the question of release raised by the supplemental bill must be first determined."

AUCTION SALES:

*Bradford Coal Co.*—50 shares, at $4 for lot.

*New Jersey Zinc Co.*—11 shares, par $100, at $440 for lot.

*North Branch Iron and Coal Co.*—25 shares, $25 par, at $3.56 for lot.

*Pennsylvania Salt Manufacturing Co.*—100 shares, at $74¼@$74½.

*Harrisburg Bridge Co.*—13 shares, at $13¼.

*The Delaware & Hudson Canal Co.'s Report for* 1878.—The following report of the business of the company for the year ending December 31st, 1878, is herewith submitted. It shows a profit on the business of the company proper of $440,971, and a loss on the leased lines of $498,562, leaving a net deficit of $57,591, as exhibited in table "A." This result, less favorable than was reasonably anticipated, is chiefly due to the unsatisfactory manner in which the coal tonnage was managed by the recent association of the coal companies under their arrangement of January, 1878. The unprecedentedly low prices that ruled during the last six months of 1877 induced dealers in coal to accumulate stocks far beyond their immediate wants, and this fact, coupled with the exceptionally mild winter of 1877-78, en-

forced a large curtailment of mining for the first six months of 1878.

Meanwhile prices gradually advanced to a fairly remunerative rate, and the prospects were very flattering for a profitable fall and winter business. Dealers were satisfied with the action of the associated companies, and, confident that their terms of arrangement would be carried out, responded to the changed condition of affairs. At this time some of the companies, mistaking, perhaps, the real cause of the improvement, and feeling the restrictions imposed upon mining to be burdensome, called for and obtained an increase of the allotments agreed upon from time to time. The natural effects followed this action; prices for coal were again demoralized, and producers and consumers alike lost all faith in the maintenance of the arrangement. Buying was again limited to immediate necessities, and a formal dissolution of the association followed on December 28th.

We believe that if the terms of the compact had been carried out firmly, and the production of coal kept within proper limits, the entire coal interest would now be on a sound and profitable basis, with prices satisfactory to both producers and consumers. Waste and destruction is not competition, and when an article like coal, that can not be reproduced, will not, owing to a forced surplus stock, pay the actual cost of mining, transporting, and handling, with a fair compensation for the coal in the ground, and a reasonable return for the investments necessary to its production, the public, either directly or indirectly, must bear the loss. The time is probably not far distant when the consumption of coal will overtake the natural limit of production. In the mean time it would seem to be only the exercise of prudent discretion on the part of those managing this large interest to avail of every just and lawful means to protect it from the exhaustion and loss inevitably attendant upon what has been called open competition.

The interest of producers can not be separated so far as tonnage is concerned. All must share alike in the consequences of over-production. The law of supply and demand is the governing factor—it can not be disregarded without derangement of prices, and an attempt to force the sale of any article beyond its consumptive requirement must result in loss. It is therefore simply idle to contend that 28,000,000 tons of coal (a possible production) can be sold profitably in a market where 22,000,000 is the outside limit of consumption. Judiciously managed, the smaller amount will have a greater money value than the larger. When this proposition is demonstrated anew by the course of events, some fair and honorable means will be found to place the coal trade upon a sound commercial basis, and coal properties will once more occupy the position that their magnitude and intrinsic value justly entitle them to in public estimation.

The finances of the company are in a satisfactory condition. The proceeds of the new mortgage loan have been applied as follows: $5,000,000, by its terms, secures the loan of 1894; $2,450,000 have been negotiated, and $2,550,000 are still held by the company. This loan was created to retire maturing bonds, as well as to pay off the floating debt, and it is proper to state that the liabilities of the company have been increased to the extent of $865,000 only since December 31st, 1876. The debit to general profit and loss account has been increased by losses and shrinkages.

The property of the company is in the best possible condition, and every department is in excellent working order. The net earnings of our railroads and leased lines are steadily improving, and our earnings other than coal are annually increasing. The Boston, Hoosac Tunnel & Western Railroad Company confidently expect to complete their work during the present season, which will give us a direct communication with New England by way of the Hoosac Tunnel, and as the laying of a third rail by the New York, Lake Erie & Western on its entire line gives us a connection at Binghamton with the Western and Southern system of railroads, we may reasonably anticipate a large increase of business for our Albany & Susquehanna and its connections.

Following is the profit and loss account of the company for the year ending December 31st, 1878, compared with the same account for the preceding year:

| DR. | 1877. | 1878. | Differences. |
|---|---|---|---|
| To coal on hand December 31st | $698,758 | $341,036 | Dec. $357,722 |
| To mining coal | 2,077,370 | 2,264,227 | Inc. 186,857 |
| To transportation | 488,073 | 618,251 | Inc. 130,178 |
| To freight of coal and canal expenses | 759,348 | 820,438 | Inc. 61,090 |
| To Rondout expenses | 136,634 | 131,494 | Dec. 5,140 |
| To freight paid other lines | 422,745 | 397,037 | Dec. 25,709 |
| To harbor and yard expenses | 397,390 | 79,033 | Inc. 9,491 |
| To taxes | | 181,322 | |
| To salaries, rent, and miscellaneous and law expenses | | 146,526 | |
| To interest | 1,157,351 | 1,340,956 | Inc. 183,605 |
| To loss on leased lines | 605,366 | 498,562 | Dec. 106,804 |
| Total | $6,743,039 | $6,818,887 | Inc. $75,848 |
| CR. | 1877. | 1878. | Differences. |
| By sale of coal to December 31st | $4,638,871 | $5,229,266 | Inc. $590,395 |
| By canal tolls | 44,313 | 39,099 | Dec. 5,214 |
| By net earnings Pennsylvania RR. | 248,274 | 398.218 | Inc. 149,944 |
| By interest on investments | 294,311 | 341,780 | Inc. 47,469 |
| By miscellaneous profits | 28,900 | 80,146 | Inc. 51,246 |
| By coal on hand December 31st | 341,036 | 672,784 | Inc. 331,748 |
| By balance | 1,147,332 | 57,591 | Dec. 1,089,741 |
| Total | $6,743,039 | $6,818,887 | Inc. $75,848 |

Following are the assets of the company on December 31st, 1878, compared with the assets on December 31st, 1877:

| | 1877. | 1878. | Differences. |
|---|---|---|---|
| Canal | $6,339,210 | $6,339,210 | ..... |
| Railr'd and equipment | 6,209,980 | 6,190,765 | Dec. $19,215 |
| Real estate | 8,622,912 | 8,643,783 | Inc. 20,871 |
| Mine improvements | 2,386,324 | 2,404,962 | Inc. 18,638 |
| Boats, barges and steamboats, fixtures and equipment, etc. | 1,190,923 | 1,151,898 | Dec. 39,025 |
| Lackawanna & Susquehanna Railroad | $1,021,153 | $1,022,293 | Inc. $1,140 |
| Cherry Valley & Sharon Railroad | 314.870 | 305,991 | Dec. 8,879 |
| New York & Canada Railroad | 3,597,086 | 3,597,074 | Dec. 12 |
| Lackawanna Palace Car Co. | 54,675 | 54.675 | ..... |
| Telegragh lines | 14,734 | 14,734 | ..... |
| Supplies on hand | 1,089,853 | 958,667 | Dec. 131,186 |
| Coal on hand | 341,036 | 672,784 | Inc. 331,748 |
| Advances to lea'd lines | 385,374 | 439,020 | Inc. 53,646 |
| Miscellaneous assets | 6,622,687 | 5,929,323 | Dec. 693,364 |
| Cash on hand | 328,808 | 1,297,636 | Inc. 968,828 |
| General profit and loss | 194.659 | 587,185 | Inc. 392,526 |
| Total | $38,714,291 | $39,610,006 | Inc. $895,715 |

Following are the liabilities of the company on December 31st, 1878 and 1877:

| | 1877. | 1878. | Differences. |
|---|---|---|---|
| Capital stock | $20,000,000 | $20,000,000 | ..... |
| Funded debt | 15,098,000 | 17,288,000 | Inc. $2,190,000 |
| Loan, 1880 | 1,912,500 | 1,045,000 | Dec. 867,500 |
| Interest and dividends payable January 1st | 780,141 | 855,493 | Inc. 75,353 |
| Depositors | 214,700 | 215,435 | Inc. 735 |
| Dividends and interest unclaimed | 35,239 | 35,577 | Inc. 248 |
| Notes payable | 223,000 | 170,500 | Dec. 52,500 |
| December accounts | 420,992 | ..... | Dec. 420,992 |
| Taxes | 29,628 | ..... | Dec. 29,628 |
| Total | $38,714,291 | $39,610,006 | Inc. $895,715 |

Under the head of "miscellaneous assets," are embraced the following bonds, stocks, etc.:

| Bonds— | 1877. | 1878. | Differences. |
|---|---|---|---|
| Boston, Hartford & Erie | $929,644 | $875,997 | Dec. $53,647 |
| Jefferson Railroad | 103,050 | 103,050 | ..... |
| Albany and Susquehanna consols | 437,000 | 362,000 | Dec. 75,000 |
| Delaware & Hudson Canal Co. | 790,000 | 746,000 | Dec. 44,000 |
| Rhinebeck and Connecticut | 300,000 | ..... | Dec. 300,000 |
| Sundry assets | ..... | 386,247 | Inc. 386,247 |
| Stocks— | | | |
| Albany & Susquehanna | 900,000 | 900,000 | ..... |
| Rensselaer & Saratoga | 822,137 | 822,137 | ..... |
| Sundry stocks | 97,512 | 100,012 | Inc. 2,500 |
| Sundry small accounts | 59,168 | ..... | Dec. 59,168 |
| Advance in coal royalties | 581,289 | 617,246 | Inc. 35,957 |
| Bills and accounts receivable | 1,602,885 | 1,016,631 | Dec. 586,254 |
| Total | $6,622,687 | $5,929,323 | Dec. $693.364 |

The value of the Boston, Hartford & Erie bonds is given this year at $1,254,268; the sinking fund amounts to $378,271, leaving the balance of $875,997.

Following is the profit and loss statement of the leased railroad lines of the company for the years 1877 and 1878:

EXPENSES.

| | 1877. | 1878. | Differences. |
|---|---|---|---|
| Operating railroads | $883,549 | $853,398 | Dec. $30,151 |
| Maintaining railroads | 541,937 | 507,148 | Dec. 34,789 |
| Maintaining equipment | 308,680 | 258,096 | Dec. 50,584 |
| Total | $1,734,167 | $1,618,644 | Dec. $115,523 |
| Interest, rental and dividends on "leased lines" | $1,628,105 | $1,709,488 | Inc. $81.383 |
| Total | $3,362,273 | $3,328,133 | Dec. $34,140 |

EARNINGS.

| | 1877. | 1878. | Differences. |
|---|---|---|---|
| Passengers | $1,090,474 | $1,079,978 | Dec. $10.496 |
| Freight | 1,744.546 | 1,749,591 | Inc. 5,045 |
| Total | $2,835, 20 | $2,829,570 | Dec. $5,450 |
| Balance charged to profit and loss account, Delaware & Hudson Canal Company | 527,252 | 498,562 | Dec. 28,690 |
| Total | $3,362,273 | $3,328,133 | Dec. $34,140 |

## DIVIDENDS.

OFFICE OF THE HOMESTAKE MINING COMPANY, No. 31 BROAD STREET, NEW YORK, May 13, 1879.

DIVIDEND NO. 5.

The regular monthly dividend of THIRTY CENTS per share has been declared for APRIL payable at the office of the Transfer Agents, WELLS, FARGO & CO., 65 Broadway, on the 26th inst. Transfer-Books close on the 20th inst. H. B. PARSONS, Assistant Secretary.

## NOTICE.

RICHARD P. ROTHWELL, MINING ENGINEER and Managing Editor of the ENGINEERING AND MINING JOURNAL, is now making an extended tour through the Mining Regions of the West, including Montana. Until about the 25th of May, his address will be the Walker House, Salt Lake City; but parties desiring his professional services can obtain information at this office, and be put in communication with him by telegraph at any time.


## FINANCIAL.

W. W. HANLY & CO., BANKERS AND BROKERS, 60 Broadway, New York,
Buy and sell mining stocks on commission on New York Mining Stock Exchange, and offer superior facilities on San Francisco Exchanges through agency of the Bank of California.

VAN DEVENTER & PATTON,
Successors to LUDLOW PATTON & Co.,
**Bankers and Brokers,**
NO. 6 WALL STREET, NEW YORK.
C. H. VAN DEVENTER. WILLIAM LUDLOW PATTON.
Stocks, Bonds, Gold and Government Securities Bought and Sold on Commission. Loans negotiated. Interest allowed on deposits. Dividends and Interest Warrants collected and remitted.

C. T. YERKES, JR., & CO.,
**Bankers and Brokers,**
305 CHESTNUT STREET, PHILADELPHIA.
Agents for the sale of the stock of the
GREEN MOUNTAIN MINING COMPANY OF CALIFORNIA.

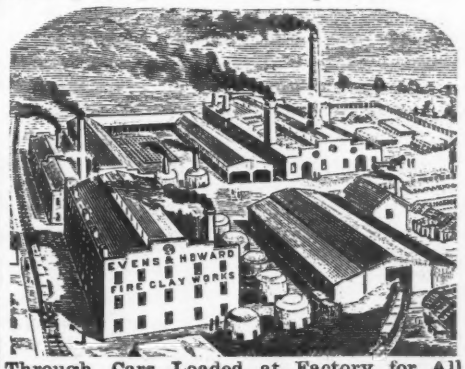
## THE PLUMAS
## National Quartz Mining Co. of California.
Business and Transfer Agency of Company,
**54 Broad Street, N. Y., Room 8.**
Sole Agents for Sale of Stock. **L. P. BAYNE & CO.**
**54 Broad Street, N. Y., Room 8.**

PARKER HANDY. —— J. S. CRONISE.
## HANDY & CRONISE,
BANKERS,
AND DEALERS IN
## Bullion and Specie,
**24 NASSAU ST., NEW YORK.**
Dealing exclusively in
GOLD AND SILVER BULLION AND COINS
of all kinds, we are prepared to guarantee satisfaction to those who may intrust their business to us.
We will make special arrangements with BANKERS and others dealing in GOLD DUST or in GOLD OR SILVER BARS, and will pay over to their correspondents here, as we may be directed, advances on Bullion when received or when the proceeds are ascertained.
We refer to:
American Exchange N. Bank, The Third National Bank,
Winslow, Lanier & Co., Eugene Kelly & Co.,
Eugene S. Ballin & Co.

W. H. ASHTON. P. DOYLE.
## ASHTON & DOYLE,
Dealers in Gold and Silver Mines and Valuable
MINERAL PROPERTIES,
solicit correspondence for sale or purchase.
**161 Broadway, New York.**

**$10 to $1000** invested in Wall Street Stocks makes fortunes every month. Book sent free explaining every thing.
Address BAXTER & CO., Bankers, 17 Wall St., N. Y

## ATTENTION!
**ARCHITECTS, CONTRACTORS, & BUYERS.**
**Use the Evens & Howard Brand of Standard Salt-Glazed Fire-Clay Sewer-Pipe, Fire-Brick, Gas-Retorts, etc. Best quality and lowest prices.**




**Through Cars Loaded at Factory for All Accessible Points.**
**Office, 916 Market St., St. Louis.**

# CHEYENNE GOLD MINING COMPANY

## OF BLACK HILLS, DAKOTA TERRITORY.

**MINE LOCATED IN THE GREAT MINERAL BELT NEAR DEADWOOD.**

ORGANIZED UNDER THE LAWS OF THE STATE OF NEW YORK.

**CAPITAL STOCK, $1,000,000. PAR VALUE OF SHARES, $5.**

**FOREVER UNASSESSABLE.**

R. P. CORMACK,.....President | D. B. CANOL..Vice-President and General Manager,
R. McNAUGHT.....Secretary and Treasurer | Deadwood, D. T.

This mine is situated in the heart of the Black Hills, and on the acknowledged richest gold belt on this continent, if not in the world.

The improvements on the mine consist of a shaft 36 feet deep, from which a drift has been run 21 feet, all in paying ore. On a level with the orifice of the shaft a drift has been driven 42 feet, with a northeasterly cross-cut 28 feet 7 nches, from where a back stope was run up to the grass roots, giving a breast of 31 feet 10 inches, and 37 feet wide. Eighty-five feet below the adit a tunnel has been commenced and run 66 feet, and will strike the ore-body at present disclosed at the bottom of the shaft 22 feet lower.

From this work 250 tons of ore have been milled as a test, the lowest being $8.40, and highest $25.60. The work thus accomplished shows at the lowest estimate 10,000 tons of ore in sight.

The Directo s have set aside 50,000 shares of stock for the purchase of machinery.

**ANNOUNCEMENT.—The 20,000 shares offered at $1 having been all taken, 10,000 shares are now offered at $1.50 per share until further notice. In this connection the Company begs to announce that it has purchased the Hoodlebug Mine, a property adjoining the Cheyenne, and of great proven value.**

We respectfully invite the closest scrutiny and most searching investigation into the merits of this property.

**R. P. CORMACK, President.** **R. McNAUGHT, Secretary,**

**Office, 61 Broadway, Room 38, New York.**

## To Advertisers.

The ENGINEERING AND MINING JOURNAL has many times the circulation of any other journal of its class in America.

It has the best and most influential circulation of any technical paper in this country.

It has a very large foreign circulation, having subscribers in every civilized country in the world.

Its advertising rates, considering the class and extent of its circulation, are very moderate; and, as they are *the same for all*, none of its patrons are unfairly taxed for the benefit of others.

*COPP'S U. S. MINING DECISIONS.*—Gives in full the Mining Laws of July 26th, 1866; July 9th, 1870, and May 10th, 1872, with all the Circular Instructions and Important Decisions thereunder down to April, 1874. 8vo, law sheep; pages 351. $4.50.
Address,
THE SCIENTIFIC PUBLISHING CO.,
P. O. Box 4404. 27 Park Place, New York.

**MAGNIFICENT COLLECTION OF MINERALS**

## FOR SALE.

A choice collection of

**NEARLY 4000 SPECIMENS,**

many of which are rare and valuable crystallized minerals, will be sold at

**Less than Half their Value.**

The specimens are from every part of the world—mostly European and Asiatic—and are packed in

TWO BEAUTIFUL CABINETS.

Address

**MINERAL COLLECTION,**

**27 Park Place, P. O. Box 4404, New York.**

# Cliff Copper Mine

## FOR SALE!

THE PROPERTY KNOWN AS THE

## CLIFF MINE,

situated in the very center of the Copper-bearing Mineral Range of Keweenaw Point, on Lake Superior, comprising all the

BUILDINGS AND MACHINERY

on said mine, and about

3500 ACRES OF LAND,

on which is the famous "Cliff Vein," is now offered for sale.

The property has a frontage on the Lake Shore of more than two miles, on which are known to be many veins and belts of rock-carrying copper still unexplored, and which future work may prove to be of much value. A large quantity of wood is yet standing, suitable for mine purposes and for fuel.

The machinery—pumping and hoisting engines and stamp mill—is all in good condition.

The mine is opened to the two hundred (200) fathom level, which is connected by a perpendicular shaft with the surface. This level extends about fifteen hundred feet in its opening, from the shaft, and with the exception of forty tons of heavy copper taken from one point, the vein for this length is undisturbed, and no stoping has been done in the back, which must contain considerable heavy copper, from the exposure of mineral in the winzes sunk while opening the ground.

For two years past the mine has been worked by tribute, from the 190 to the surface, by a force of from twenty to forty men, who have made good wages for themselves, and produced satisfactorily for the mine.

The belts of rock that have been so successfully worked in the Central mine, and which are still so profitably productive, have never been mined in the Cliff; but can be easily opened from the levels and shafts of that mine—the territory offered for sale comprising within its boundaries the same geological belts.

☞ For further information, apply to

**O. A. FARWELL,**
AT THE MINE, or
**M. H. SIMPSON,**
7½ BEACON STREET, BOSTON.

# PATENTS.

**P. A. LEHMANN, Solicitor of Patents, Washington, D. C.**
**NO PATENT NO PAY.** *Send for Circular.*


## ADVERTISERS' INDEX.


*Page.*

**Air Compressors:**
Clayton, Steam Pump Works, Brooklyn, N. Y. ... i
Griffith & Wedge, Zanesville, Ohio ... iii
Rand Drill Co., New York ... xii
National Drill and Compressor Co., New York ... xii

**Attorneys and Counselors:**
Drinker, Henry S., Philadelphia, Pa ... ix

**Bankers and Brokers:**
Ashton & Doyle, New York ... 365
Baxter & Co., New York ... 365
Handy & Cronise, New York ... 365
Hanley, W. W., & Co., New York ... 365
Van Deventer & Patton, New York ... 365
Yerkes, C. T., Jr., & Co., Philadelphia, Pa. 365

**Belting and Rubber:**
New York Belting and Packing Co., N. Y. ii
Gutta Percha & Rubber Mfg. Co., N. Y. ii

**Blasting Powder:**
Laflin & Rand Powder Co., New York ... iii
Miners' Supply Co., St. Clair, Pa ... iii
Willard, J. W., Cleveland, O ... vi

**Blowers:**
Wilbraham Bros., Philadelphia, Pa ... xii
Worthington, H. R., New York ... iii

**Boilers, Boiler Tubes, and Steam and Water Pipes:**
St. Louis Boiler Yard, St. Louis, Mo ... —
Worthington, H. R., New York ... iii

**Bolts:**
Shumway, Burgess & Co., Chicago, Ill ... vi

**Books and Periodicals:**
American Journal of Science and Art ... ix
Brick, Pottery, and Glass Journal, N. Y. iv
Capital and Labour, London, Eng ... ix
Colliery Guardian, London, Eng ... ix
Denver Tribune, Denver, Colo ... ix
Engineering, London, Eng ... v
Gold and Silver Mines of America, N. Y. ... ix
La Houille, Paris, France ... iii
Manufacturer and Builder, New York ... ii
Miners' Journal, Pottsville, Pa ... ix
Railway Age, Chicago, Ill ... ix
Spon, E. & F. N., New York ... vi
Teknisk Tidskrift, Stockholm, Sweden ... ix

**Clay Mines:**
Ernst, Otto, South Amboy, N. J ... ii

**Clocks:**
Seth Thomas, Thomaston, Conn ... v

**Coal:**
Berwind, White & Co., New York ... xi
Borda, Eugene (Koh-i-noor Coal), Phila ... xi
Borden & Lovell, New York ... xi
Consolidation Coal Co., Baltimore, Md ... xi
Coxe Bros. & Co., New York ... xi
Cox & Boyce, New York ... xi
Hoboken Coal Co., Hoboken, N. J ... xi
Maryland Coal Co., New York ... xi
New Central Coal Co., New York ... xi
Philadelphia & Reading Coal and Iron Co. xi
Swords, A. S., New York ... xi
Wells, Joseph K., New York ... xi

**Copper Dealers:**
Baltimore Copper Co., Baltimore, Md ... v

**Crushers, Ore:**
Blake Crusher Co., New Haven, Conn ... vi
Copeland, E. T., New York ... vi

**Dividends:**
Homestake Mining Co., New York ... 365

**Educational:**
Lehigh University, Bethlehem, Pa ... vi

**Emery Wheels:**
New York Belting and Packing Co., N. Y. ii

**Engineers and Chemists:**
Beckett & McDowell, New York ... v
Bradt, W. H., Leadville, Colo ... ix
Church, John A., Columbus, O ... ix
Hooker, W. A., New York ... ix
Hunt, Dr. T. Sterry, Montreal, Canada ... ix
Keyes, W. S., San Francisco, Cal ... ix
Maynard, Geo. W., New York ... ix
Porter, J. A., Eureka, Nev ... ix
Randolph, John C., New York ... ix
Rolker, Chas. M., Reno, Nev ... ix
Rothwell, Richard P., New York ... ix
Stwolinski, F. de, Joplin ... ix
Wulsten, Carl, Rosita, Col ... ix
Wilson Bros. & Co., Philadelphia ... ix

**Engineers' Instruments:**
Gurley, W. & L. E., Troy, N. Y. ... iv
Heller & Brightly, Philadelphia ... vi
Keuffel & Esser, New York ... v
Woolman, G. S., New York ... v

**Financial:**
Baxter & Co., New York ... 365

**Fire Brick:**
Ernst, Otto, South Amboy, N. J ... ii
Evans & Howard, St. Louis, Mo ... 365

**For Sale:**
Cliff Copper Mine, Boston, Mass ... viii
Crocker Brothers, New York ... vi

**Grease:**
Jos. Dixon Crucible Co., Jersey City, N. J. vi

**Hoisting Machinery:**
Copeland & Bacon, New York ... xii
Crane Brothers Man'f'g Co., Chicago, Ill. x
Griffith & Wedge, Zanesville, O ... iii

**Iron Works For Sale:**
Boonton Iron Works, New York ... vi

**Locomotives:**
Manchester Locomotive Works, Manchester N. H ... xii

**Metal Brokers:**
White, Edward P., New York ... ii

**Mineral Wool:**
Elbers, Alexander D., New York ... iii

**Mining Companies:**
Cheyenne Gold Mining Co., New York ... viii
Massachusetts and New Mexico Mining Co., Boston, Mass ... i
Pemberton Hydraulic Gold Mining Co., Boston, Mass ... vi
Plumas National G. Mining Co., New York. 365

**Mining, Milling, and Smelting Machinery:**
Aitchison, R., & Co., Chicago, Ill ... iv
Blake's Stone Breaker, New Haven, Conn. vi
Copeland & Bacon, New York ... xii
Crane Bros. Mfg. Co., Chicago, Ill ... x
Forster-Firmin Gold and Silver Amalgamating Co., Norristown, Pa ... vi
Fraser, Chalmers & Co., Chicago, Ill. iv
Griffith & Wedge, Zanesville, O ... ii
Morey & Sperry, New York ... ii

**Perforated Sheet Metals:**
Aitchison, R. & Co., Chicago ... iv

**Patents:**
Lehman, F. A. Washington, D. C. ... viii

**Pig Lead:**
Lone Elm Mining and Smelting Co., Joplin, Mo ... iii

**Photography:**
Rockwood, George G., New York ... i

**Pumps:**
Cameron, A. S., New York ... iii
Clayton Steam Pump Works, Brooklyn, N. Y. ... i
Crane Brothers Manufac'g Co., Chicago ... iii
Deane Steam Pump Works, New York ... iii
Knowles Steam Pump Works, New York. i
Worthington, H. R., New York ... iii

**Railroads and Transportation:**
Colorado Central R.R. ... ix
New York & Philadelphia New Line ... ix
Pennsylvania R.R. ... x

**Rock Drills:**
Am. Diamond Rock Boring Co., N. Y. ... xii
Burleigh Rock Drill Co., Fitchburg, Mass. xii
Ingersoll Rock Drill Co., New York ... ii, xii
Johnson Rock Drill Manufacturing Co., Boston, Mass ... xii
National Drill & Compressor Co., New York ... xii
Penn. Diamond Drill Co., Pottsville, Pa. xii
Rand Drill Co., New York ... xii
Sampson, Geo. H., Boston, Mass ... xii

**Roofing:**
Hyndman, W. G., & Co., Cincinnati, O ... iii
Northrop, H., Co., Pittsburg, Pa ... i
Porter Iron-Roofing Co., Cincinnati, Ohio. —
Scaife, Wm. B., & Sons, Pittsburg, Pa ... iv

**Rope and Blocks:**
Gilbert, Hubbard & Co., Chicago, Ill ... ii

**Safes and Scales:**
Chicago Scale Co., Chicago, Ill ... i
Marvin Safe & Scale Co., New York ... v

**Saws:**
Curtis & Co., St. Louis, Mo ... ii

**Smelting and Refining Works:**
Robertson, R. J., New York ... ii
Stetefeldt Furnace Co., San Francisco, Cal. i

**Steam Fire-Engines:**
Manchester Locomotive Works, Manchester, N. H ... xii

**Steel Works:**
Crescent Steel Works, Pittsburg, Pa ... iii
Park, Bro., & Co., Pittsburg, Pa ... iii
Quincy, J. W., New York ... —
Sanderson Brothers Steel Co., Syracuse, N. Y ... ii

**Tackle Blocks:**
Bagnall & Loud, Boston, Mass ... xii

**Taps and Dies:**
Pratt & Whitney Co., Hartford, Conn ... ii

**Tramway:**
American Wire-Rope Tramway Co., Phila. v

**Valves:**
Mohawk & Hudson Manufacturing Co., Waterford, N. Y ... iii

**Watchman's Time Detector:**
Buerk, J. E. Boston, Mass ... ii

**Water Ejectors:**
Jamison, J. C., Newark, N. J ... —

**Water Wheels:**
Leffel, James, & Co., Springfield, O ... iv

**Wire Rope:**
Cannon, H., & Co., Chicago, Ill ... iv
Copeland & Bacon, New York ... xii
Haigh, J. Lloyd, New York ... i
Hazard Mfg. Co., Wilkes-Barre, Pa ... v
Hubbard, Gilbert & Co., Chicago ... ii
Mason, John W. & Co., New York ... i
Roebling's, J. A., Sons Co., Trenton, N. J. iv